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Mariners Weather Log

tional Oceanic and Atmospheric Administration • National Environmental Satellite, Data, and Information Service • National Oceanographic Data Center

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THIS ISSUE ALONG

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Mariners Weather Log

Editor: Elwyn E. Wilson

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Front Cover: Soviet ships struggle through the ice in the Chukchi Sea trying to resupply Siberia for the winter. Icebreakers had to free dozens of ships and convoy them to open water. Many ships and even icebreakers were damaged and one ship sank with all rescued. SOVFOTO by Yuri Ilyenko.

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The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through April 1, 1985.

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Mariners Weather Log

EASTERN NORTH PACIFIC TROPICAL CYCLONES, 1983

E. B. Gunther and R. L. Cross
Eastern Pacific Hurricane Center
National Weather Service, NOAA
Redwood City, Calif.

The 1983 tropical cyclone season in the eastern North Pacific was one of the most active on record. The season began on 21 May with hurricane Adolph and ended on 7 December with hurricane Winnie. Spanning 201 days, it was one of the longest tropical cyclone seasons on record. It was also the first time since prior to 1947 that an eastern North Pacific tropical cyclone developed during the month of December (Rosendal, 1962). Although the 1983 season had two less cyclones than the highly active 1982 season, more of the 1983 cyclones (21) reached tropical storm or hurricane intensity than during the 1982 season (19). Of the 24 cyclones during 1983, 3 were tropical depressions, 9 were tropical storms, and 12 were hurricanes. The number of hours during which there were tropical storms in 1983 totaled 1,238, compared to 1,044 in 1982, 858 in 1981, and 476 in 1980. Hurricane hours totaled 1,098 in 1983, 774 in 1982, 432 in 1981, and 586 in 1980. The highest sustained wind speed during the 1983 season was 125 kn with hurricane Kiko on 3 September and hurricane Raymond on 11 October. Eight of the 1983 hurricanes had sustained wind speed equal to or in excess of 100 kn, compared to 4 out of 11 in 1982, 1 out of 8 in 1981, and 3 out of 7 in 1980. Table 1 shows the monthly distribution of 1983 tropical cyclone activity and tables 2 and 3 compare this activity with that of recent years. The 1966-83 period was chosen for comparison since it probably includes all tropical cyclone activity in the area due to the excellent satellite coverage since 1966. Prior to that time some tropical cyclone activity went undetected due to the sparsity of data in the Tropics. A summary of the important features of the 1983 season is given in table 4. Cyclone tracks are shown on the six charts of figure 1.

The Eastern Pacific Hurricane Center issued 580 tropical cyclone advisories during the 1983 season, compared to 509 in 1982, 309 in 1981, and 470 in 1980. Advisories were issued four times daily on a regularly scheduled basis for cyclone positions at 0000, 0600, 1200, and 1800 GMT. Additional advisories were issued by the Central Pacific Hurricane Center (CPHC) in Honolulu on three of the 1983 cyclones that moved across 140°W longitude and into the CPHC's area of forecast responsibility.

Three tropical cyclones moved onshore during the 1983 season, all into Mexico. The first to move onshore was hurricane Adolph on 28 May. Winds near the center of the cyclone had diminished to 35 kn as the storm moved onshore 50 mi southeast of Mazatlan at 0800 on 28 May. The storm weakened rapidly as it moved inland and no reports of damage or casualties were received. The second cyclone to move onshore was hurricane Tico on 19 October. The cyclone had formed 927, 500 mi south of Acapulco, Mexico, moved roughly northwestward until it was south of the Baja California peninsula, then turned northeastward and move rapidly inland over Mazatlan, Mexico with 110-kn winds at 1500 on 19 October. Twenty-five thousand people were left homeless in the vicinity of Mazatlan and property damage was estimated near $66 million. Reports from Mexico several days later indicated 9 people had lost their lives in the storm, 105 people were still missing, and several boats had been sunk. The last cyclone of the season to move onshore was tropical depression 22. With only 30 kn winds near the center, the cyclone moved inland 110 mi southeast of Manzanillo, Mexico at 1900 on 18 October.

Although some ships passed close to the centers of tropical cyclone activity during the 1983 season and undoubtedly experienced heavy weather and seas, no reports of casualties or damage were received from them.

The National Weather Service Satellite Service Field Station, collocated with the Eastern Pacific Hurricane Center (EPHC), provided excellent satellite coverage during the 1983 season. Visual and infrared satellite imagery was available from the geostationary GOES and polar-orbiting NOAA satellites. Cyclonic intensity was calculated using the Dvorak technique of satellite analysis (Dovorak, 1973).

As hurricane Ismael moved northward off the Baja California coast, U.S. Air Force reconnaissance aircraft made three penetrations into the cyclone on 13 August. Five weeks later, and in nearly the same location, the Air Force once again flew into tropical cyclone activity, this time into hurricane Manuel. Two flights were made, with two penetrations each, one on the 18th and the other on the 19th of September. NOAA research aircraft made the last two flights of the season. The first, with one penetration, was made into hurricane Raymond on 10 October as the cyclone moved westward toward the Hawaiian Islands. The second flight, with two penetrations, was made three days later into hurricane Tico as the cyclone, 250 mi southwest of Acapulco, moved northward toward the Mexican coast.

Even though satellite imagery continues to improve and is probably one of the most important

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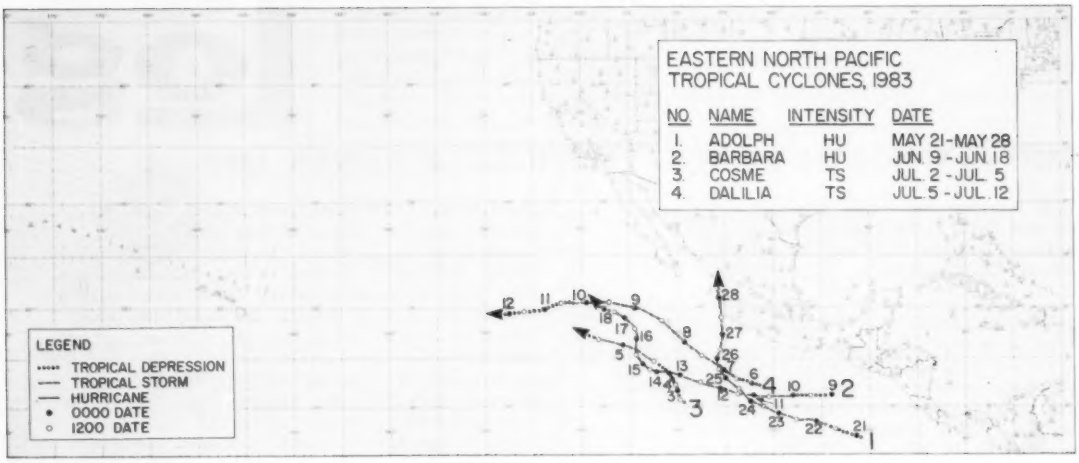
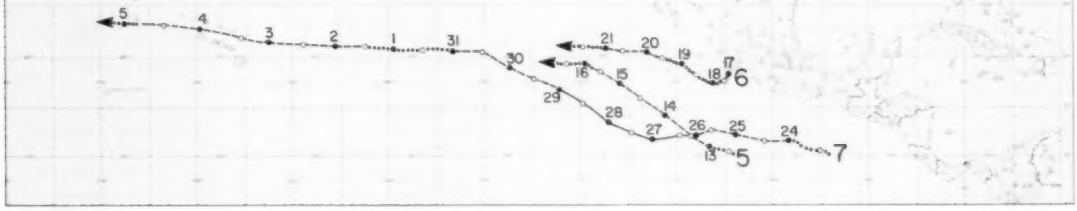
EASTERN NORTH PACIFIC
TROPICAL CYCLONES, 1983

NO.	NAME	INTENSITY	DATE
1.	ADOLPH	HU	MAY 21-MAY 28
2.	BARBARA	HU	JUN. 9 - JUN. 18
3.	COSME	TS	JUL. 2 - JUL. 5
4.	DALILIA	TS	JUL. 5 - JUL. 12



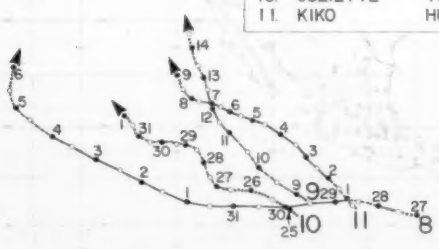
EASTERN NORTH PACIFIC
TROPICAL CYCLONES, 1983

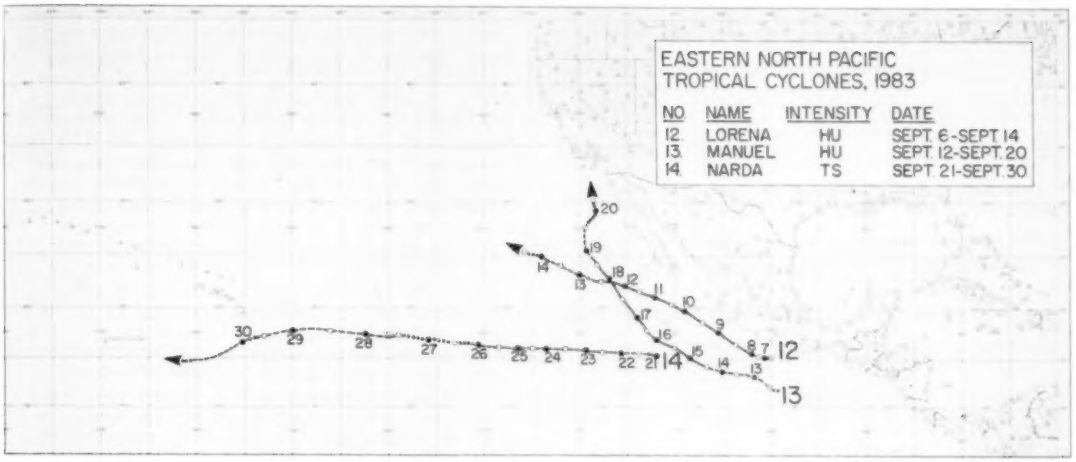
NO.	NAME	INTENSITY	DATE
5.	ERICK	TS	JULY 12 - JULY 16
6.	FLOSSIE	TS	JULY 17 - JULY 21
7.	GIL	HU	JULY 23 - AUG. 5

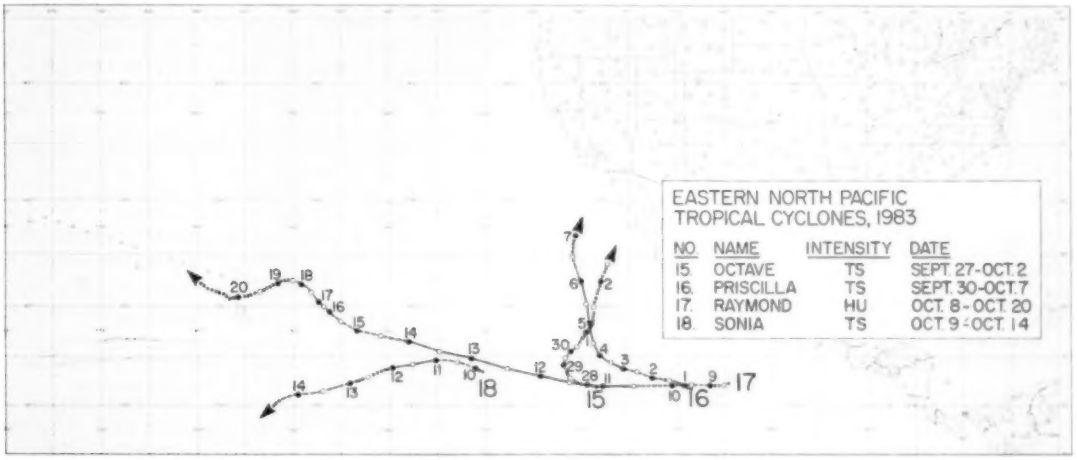


EASTERN NORTH PACIFIC
TROPICAL CYCLONES, 1983

NO.	NAME	INTENSITY	DATE
8.	HENRIETTE	HU	JULY 27 - AUG. 6
9.	ISMAEL	HU	AUG. 8 - AUG. 16
10.	JULIETTE	TS	AUG. 24 - SEPT. 1
11.	KIKO	HU	AUG. 31 - SEPT. 9




EASTERN NORTH PACIFIC
TROPICAL CYCLONES, 1983
NO. NAME INTENSITY DATE
12. LORENA HU SEPT. 6-SEPT. 14
13. MANUEL HU SEPT. 12-SEPT. 20
14. NARDA TS SEPT. 21-SEPT. 30


EASTERN NORTH PACIFIC
TROPICAL CYCLONES, 1983
NO. NAME INTENSITY DATE
15. OCTAVE TS SEPT. 27-OCT. 2
16. PRISCILLA TS SEPT. 30-OCT. 7
17. RAYMOND HU OCT. 8-OCT. 20
18. SONIA TS OCT. 9-OCT. 14

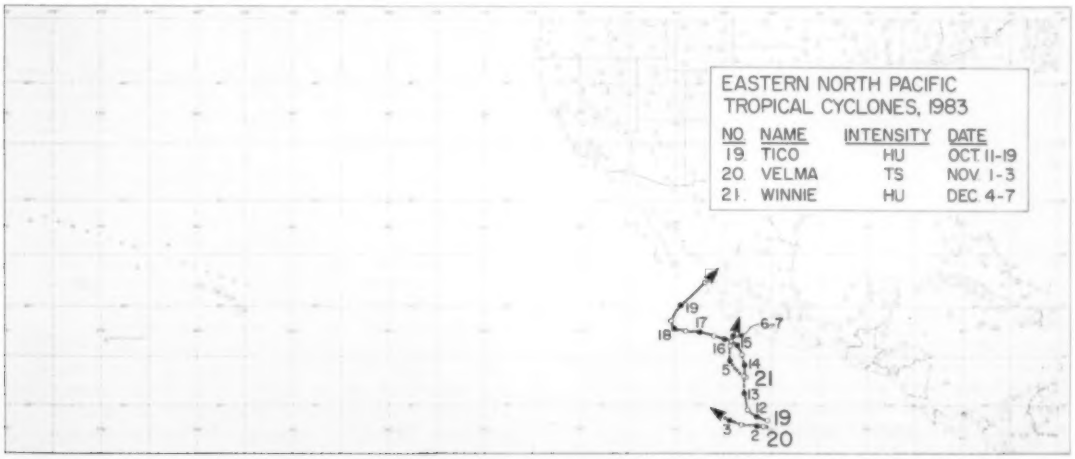

EASTERN NORTH PACIFIC
TROPICAL CYCLONES, 1983
NO. NAME INTENSITY DATE
19. TICO HU OCT. 11-19
20. VELMA TS NOV. 1-3
21. WINNIE HU DEC. 4-7

Figure 1.-- The six charts above show the tracks of eastern North Pacific tropical cyclones, 1983.

Table 1.-- Monthly distribution of eastern North Pacific tropical cyclones, 1983.*

	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Tropical depressions	0	0	0	2	0	1	0	0	3
Tropical storms	0	0	4	1	2	1	1	0	9
Hurricanes	1	1	2	2	3	2	0	1	12
Total	1	1	6	5	5	4	1	1	24

* Cyclones are ascribed to the month in which they began.

Table 2.-- Frequency of eastern North Pacific tropical storms and hurricanes combined by month and year.*

Year	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1966	0	1	0	4	6	2	0	0	13
1967	0	3	4	4	3	3	0	0	17
1968	0	1	4	8	3	3	0	0	19
1969	0	0	3	2	4	1	0	0	10
1970	1	3	6	4	1	2	1	0	18
1971	1	1	7	4	2	2	1	0	18
1972	1	0	1	6	2	1	1	0	12
1973	0	3	4	1	3	1	0	0	12
1974	1	3	3	6	2	2	0	0	17
1975	0	2	4	5	3	1	1	0	16
1976	0	2	4	4	3	1	0	0	14
1977	1	1	1	1	3	1	0	0	8
1978	1	3	4	6	2	2	0	0	18
1979	0	2	2	2	1	2	1	0	10
1980	0	3	5	2	2	2	0	0	14
1981	1	1	3	4	2	4	0	0	15
1982	1	1	6	5	4	2	0	0	19
1983	1	1	6	3	5	3	1	1	21
Total	9	31	67	71	51	33	6	1	271
Average	0.5	1.7	3.7	3.9	2.8	1.9	0.3	0.1	15.1

* Cyclones are ascribed to the month in which they began.

Table 3.-- Frequency of eastern North Pacific tropstorms reaching hurricane intensity by month and year.*

Year	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1966	0	1	0	4	2	0	0	0	7
1967	0	1	0	2	1	2	0	0	6
1968	0	0	0	3	2	1	0	0	6
1969	0	0	1	1	1	1	0	0	4
1970	1	0	1	1	0	1	0	0	4
1971	1	1	3	2	2	1	0	0	12
1972	1	0	0	6	1	0	0	0	8
1973	0	1	3	0	2	1	0	0	7
1974	0	2	2	4	2	1	0	0	11
1975	0	1	2	3	1	1	0	0	8
1976	0	2	1	2	3	0	0	0	8
1977	0	0	1	1	1	1	0	0	4
1978	1	2	3	4	1	1	0	0	12
1979	0	1	1	2	1	1	0	0	6
1980	0	2	2	2	1	0	0	0	7
1981	0	1	1	3	1	2	0	0	8
1982	0	0	4	3	3	1	0	0	11
1983	1	1	2	2	3	2	0	1	12
Total	5	16	29	45	28	17	0	1	141
Average	0.3	0.9	1.6	2.5	1.6	0.9	0	0.1	7.8

* Cyclones are ascribed to the month in which they began.

tools used by tropical forecasters, aircraft reconnaissance and synoptic ship reports retain their importance as invaluable comparative observations for both the tropical forecaster and satellite meteorologist.

HURRICANE ADOLPH, 21-28 MAY

Hurricane Adolph got the 1983 eastern North Pacific tropical cyclone season underway on 21 May. The first advisory on the cyclone was issued at 0000 with the initial position near 7.1°N, 91.5°W, unusually close to the Equator for tropical cyclone formation. The depression headed west-northwest at 10 kn over 30-31°C water. It intensified steadily and was named tropical storm Adolph at 1800, 21 May, with 40-kn winds. Adolph continued to move west-northwestward in an area of weak easterly flow aloft and was upgraded to hurricane Adolph at 1800, 23 May, near 10.4°N, 101.8°W. The storm then turned more to the northwest and continued to intensify. Adolph reached its maximum intensity of 95 kn at 0600, 24 May. It was then located near 11.4°N, 103.2°W. Thirty-six hours later, at 1800, 25 May, he took a sharp turn toward the north-northeast, steered by southwesterly flow on the west side of an anticyclonic deep-layer center over the Gulf of Tehuantepec. Sea-surface temperatures remained high, near 28°C, as the storm moved towards the Mexican coast. Increasing vertical wind shear, however, contributed towards a steady decrease in intensity. At about 1600, 27 May, Adolph entered Mexico near Tecua-Mixtle, located south of Puerto Vallarta, with maximum sustained winds near 40 kn. The storm continued to move northward at 11 kn and was again over water by 2100, 27 May. At 0800, 28 May, Adolph once again moved inland about 50 mi southeast of Mazatlan with maximum winds estimated at 35 kn. No significant damage was reported. Weather reports from the tankers ANCO STANE and EXXON BENICIA were helpful in following the progress of this hurricane.

HURRICANE BARBARA, 9-18 JUNE

Hurricane Barbara, the second tropical cyclone of the 1983 season, began as a tropical disturbance 180 mi south of the Guatemalan coast on 7 June. Moving west, the disturbance began to intensify and was upgraded to a tropical depression near 11.2°N, 93.9°W at 0000, 9 June. Twenty-four hours later, winds near the center had increased to 35 kn and the depression was upgraded to tropical storm Barbara near 11.1°N, 98.1°W. Barbara continued to move west over 30°C water for another 24 hr, then turned west-northwest near 11.0°N, 102.5°W. By 1800, 12 June the winds had increased to 65 kn and the storm was upgraded to a hurricane near 12.9°N, 109.0°W or 150 mi north of Clipperton Island. Winds near the center increased steadily, reaching their maximum intensity of 115 kn 24 hr later near 13.5°N, 111.5°W. Figure 2, a visual satellite photograph, shows Barbara with a well-defined eye and 115-kn winds near 13.5°N, 112.0°W at 2115, 13 June. Winds continued at 115 kn through 1200, 14 June, then began to slowly diminish as the hurricane turned northwestward, then northward over cooler 27°C water. Barbara was now moving at 5 kn around the west side of an upper level high pressure area centered over the west coast of central Mexico. By 0600, 16 June, the hurricane was

Table 4.-- Eastern North Pacific tropical cyclones, 1983. All times GMT, latitudes north, longitudes west. HU = hurricane, TS = tropical storm, TD = tropical depression

Table 4. Eastern North Pacific tropical cyclones, 1983. All times GMT, latitudes north, longitudes west.
HU = hurricane, TS = tropical storm, TD = tropical depression.

Cyclone	Depression	Storm	Hurricane	Storm	Depression	Final Position	m/s(kt)	Maximum Wind From	To
HU Adolph	210000	211800	231800	260600		280600	49(095)	240600	250600
21-28 May	07.1-091.5	08.1-094.7	10.4-101.8	15.2-105.8		22.3-105.8		11.4-103.2	13.4-105.4
HU Barbara	090000	100000	121800	161800	170600	180600	59(115)	131800	141800
9-18 Jun	11.2-093.9	11.1-098.1	12.9-109.0	18.5-115.0	19.0-116.0	20.0-118.4		13.5-111.5	14.3-113.6
TS Cosme	020600	041200			051200	051800	18(035)	041200	051200
2-5 Jul	10.5-109.5	14.8-112.8			17.0-118.2	17.6-119.4		14.8-112.8	17.0-118.2
TS Dalilia	051800	061800			100600	120000	31(060)	080000	081800
5-12 Jul	12.1-101.4	13.5-104.7			20.3-120.6	19.5-127.5		16.9-109.2	19.6-113.0
TS Erick	120600	130000			151800	161800	28(055)	140000	150600
12-16 Jul	10.6-103.7	11.2-106.5			19.2-118.7	19.7-121.9		14.2-111.4	18.3-117.0
TS Flossie	170000	191200			210000	211200	26(050)	191800	200600
17-21 Jul	18.3-104.9	20.0-111.3			20.6-117.6	20.8-119.7		20.3-112.2	20.5-114.4
HU Gil	231200	240000	260600	291200	310000	010000*	41(080)	270000	271800
23 Jul-1 Aug	11.0-095.3	11.5-098.2	12.2-109.4	18.0-125.0	20.6-133.4	20.9-139.5		11.7-112.8	13.0-116.0
HU Henriette	270000	271800	281800	040000	051200	060600	59(115)	310000	311800
27 Jul-6 Aug	11.2-095.0	11.8-098.1	12.5-102.4	19.1-133.2	23.5-137.5	26.9-136.5		12.0-114.3	12.2-117.7
TD Nine	030000					070600	15(030)	031800	061800
3-7 Aug	11.2-105.0					18.4-118.4		12.4-108.1	17.3-117.3
HU Ismael	081800	090000	101800	121800	140000	141200	44(085)	111200	111800
8-14 Aug	12.6-106.5	13.2-107.6	18.4-113.5	24.3-117.0	27.4-118.6	28.7-118.6		20.5-115.5	21.2-115.9
TD Eleven	150000					161200	15(030)	150600	151200
15-16 Aug	22.0-110.3					23.8-111.6		22.3-110.6	22.7-110.9
TS Juliette	241800	261800			301800	010600	26(050)	290000	291200
24 Aug-1 Sep	11.2-107.4	13.9-115.3			18.8-123.5	21.8-125.8		18.2-119.1	18.3-120.3
HU Kiko	310600	311800	011800	070600	081800	090000	64(125)	031800	040600
31 Aug-9 Sep	11.9-101.3	12.5-102.0	14.5-103.6	22.4-117.1	24.3-119.7	25.0-119.9		18.9-108.4	20.0-110.0
HU Lorena	060600	061800	071800	121800	131800	141200	52(100)	081200	090000
6-14 Sep	15.4-100.0	15.3-100.5	15.4-101.5	22.9-118.9	24.5-123.1	25.3-125.8		16.5-103.8	17.6-105.5
HU Manuel	120600	121200	140600	181800	191800	201200	52(100)	170600	171800
12-20 Sep	11.9-099.2	12.3-100.1	13.8-105.9	24.9-118.8	28.5-119.0	30.3-118.7		19.9-114.8	22.0-116.1
TS Narda	210000	210600			260600	271200*	26(050)	231200	231800
21-27 Sep	15.1-112.0	15.2-112.9			16.5-131.9	17.3-139.0		15.9-121.5	16.0-122.5
TS Octave	271800	281800			301800	021200	23(045)	290000	290600
27 Sep-2 Oct	11.8-118.3	13.5-121.7			16.6-119.8	24.0-117.3		14.2-121.9	14.6-121.9
HU Priscilla	301800	011800	030000	060000	061200	070000	52(100)	040000	041800
30 Sep-7 Oct	11.8-108.6	12.7-111.6	13.8-115.5	22.5-120.0	24.9-120.9	26.9-120.5		15.1-118.1	17.4-119.0
HU Raymond	080600	090000	101200			140600*	64(125)	111200	120000
8-14 Oct	12.4-104.4	12.3-106.4	12.0-114.6			16.8-139.4		12.4-121.2	13.0-124.3
TS Sonia	091800	100000	110000			120000	18(035)	100000	110000
9-12 Oct	13.4-130.2	13.8-131.0	14.6-135.2			13.9-139.8		13.8-131.0	14.6-135.2
HU Tico	111200	130000	141200			191200	59(115)	190000	190600
11-19 Oct	08.5-100.4	11.2-102.9	15.3-103.1			22.3-107.0		20.1-109.5	21.1-108.3
TD Twenty-two	180000					181800	15(030)	180600	181800
18 Oct	14.3-100.0					18.0-102.7		15.6-101.0	18.0-102.7
TS Velma	011800	020000			021800	030600	18(035)	020000	021800
1-3 Nov	07.9-100.9	07.9-101.6			08.2-103.8	08.5-105.0		07.9-101.6	08.2-103.8
HU Winnie	041200	050000	060000	070000	071200	071200	41(080)	060600	061800
4-7 Dec	12.9-102.9	14.5-104.3	17.0-104.1	17.0-104.1	17.0-104.1	17.0-104.1		17.0-104.1	17.0-104.1

* Passed to the Central Pacific Hurricane Center (CPHC).

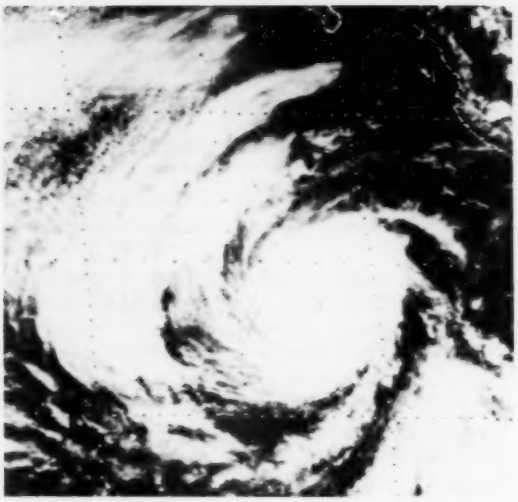


Figure 2.--Hurricane Barbara with 115-kn winds near 13.5°N, 112.0°W at 2115, 13 June.

centered near 17.5°N, 114.3°W or 205 mi west-southwest of Socorro Island. The cyclone then turned northwest and, moving at 6 kn, continued to weaken. Winds diminished to 55 kn by 1800, 16 June, and the hurricane was downgraded to a tropical storm near 18.5°N, 115.0°W. Turning west-northwestward over 22°C water, the storm began to weaken rapidly. Low level clouds moving into the cyclonic circulation from the west and a shearing action from easterly flow at the surface and southwesterly flow aloft further weakened the storm. By 0600, 17 June, the winds were down to 30 kn and the storm was downgraded to a tropical depression near 19.0°N, 116.0°W. The final advisory on the cyclone was issued 24 hr later with the center dissipating rapidly near 20.0°N, 118.4°W.

TROPICAL STORM COSME, 2-5 JULY

Between 28 June and 2 July a tropical disturbance moved westward at 12 kn near 10°N latitude from the Central American coast. At 0600, 2 July, intensification appeared and the first advisory was issued when the depression was centered near 10.5°N, 109.5°W. Maximum winds near the center were estimated to be near 25 kn. The cyclone then turned abruptly northwestward toward colder water, slowed to 4 kn for 42 hr, then accelerated northwestward at 12 to 16 kn. The tropical depression remained very disorganized throughout this period. By 1200, 4 July, satellite imagery began to show increasing convective activity and the depression was upgraded to tropical storm Cosme near 14.8°N, 112.8°W. Maximum sustained surface winds were estimated at 35 kn. This intensity was maintained for 24 hr followed by rapid dissipation as the storm moved over 24°C water. The final advisory on the cyclone was issued on 5 July.

TROPICAL STORM DALILIA, 5-12 JULY

The next cyclone of the season began as an area of intense thunderstorm activity 200 mi south of the Gulf of Tehuantepec on 4 July. Moving westward over 29°C water, the disturbance began to intensify and was upgraded to a tropical depression at 1800, 5 July, near 12.1°N, 101.4°W or 300 mi south-southwest of Acapulco. The cyclone then turned west-northwestward and, moving at 8 kn, was upgraded to tropical storm Dalilia 24 hr later near 13.5°N, 104.7°W. Turning northwestward, the cyclone reached its maximum intensity of 60 kn, at 0000, 8 July, near 16.9°N, 109.2°W. Accelerating to 15 kn, the storm passed 15 mi southwest of Socorro Island between 1000 and 1100 on 8 July. Dalilia then began to curve toward the west and weaken over colder water. By 10 July, winds near the center were down to 30 kn over 23°C water and the cyclone was downgraded to a depression near 20.3°N, 120.6°W. The cyclone dissipated rapidly near 19.5°N, 127.5°W by 10 July.

TROPICAL STORM ERICK, 12-16 JULY

A tropical disturbance, which was to become tropical storm Erick, passed into the Pacific through Central America on 9 - 10 July, and moved westward along 12°N latitude. At 0600, 12 July, the disturbance was upgraded to a tropical depression near 10.6°N, 103.7°W. Winds near the center were estimated at 25 kn over 30°C water. Steering flow was southeasterly around a deep layered anticyclone centered near the Yucatan Peninsula. The depression moved on a west-northwest track at 10 kn with slow intensification. It was named tropical storm Erick at 0000, 13 July, when it was centered near 11.2°N, 106.5°W. The storm's maximum intensity of 55 kn was attained on 14 July near 14.2°N, 111.4°W. This intensity was maintained until 0000, 15 July, after which Erick began to move over 23 - 24°C water and weaken rapidly. The final advisory was issued at 1800 16 July with remnants of the storm located near 19.7°N, 121.9°W.

TROPICAL STORM FLOSSIE, 17 - 21 JULY

Tropical storm Flossie, the 6th cyclone of the 1983 season, began as a disturbance 60 mi southwest of Manzanillo, Mexico at 1800, 16 July. Six hours later the disturbance was upgraded to a tropical depression near 18.3°N, 104.9°W. The depression drifted slowly southward for another 18 hr, then turned abruptly west-northwestward and, began to intensify over 30°C water. The container ship AMERICAN AQUARIUS, 150 mi east of the cyclone at 1800, was helpful in locating the center of the depression. By 1800, 18 July, the cyclone was near 18.9°N, 108.8°W. The TOYOTA MARU NO. 15, 25 mi to the north, was reporting winds from the northeast at 30 kn. The cyclone continued to intensify, passing 60 mi northeast of Socorro Island between 0500 and 0600, 19 July. By 1200, 19 July, the winds had increased to 35 kn and the depression was upgraded to tropical storm Flossie near 20.0°N, 111.3°W. Six hours later Flossie reached her maximum intensity of 50 kn near 20.3°N, 112.2°W, off the tip of Baja California. The storm then turned west toward colder water and increased vertical shear aloft.

By 0000, 21 July, the storm was downgraded to a depression near 20.6°N 117.6°W. Twelve hours later the final advisory was issued with the cyclone dissipating rapidly over 25°C water.

HURRICANE GIL, 23 JULY - 1 AUGUST

The seventh tropical cyclone of the 1983 season was upgraded to a depression at 1200, 23 July, near 11.0°N, 95.3°W. The deep-layer mean flow was light easterly and sea-surface temperature near the cyclone was greater than 30°C. It reached tropical storm strength at 0000 24 July near 11.5°N, 98.2°W. After reaching maximum tropical storm strength at 0000 25 July, intensification slowed. The storm reached hurricane strength on 26 July at 0000. Twenty-four hours later, Gil reached its maximum intensity at 11.7°N, 112.8°W with 80-kn winds. At that time, it also turned toward the west-northwest. Hurricane winds continued until 1200, 29 July, when Gil moved over 25°C water at 18.0°N, 125.0°W. By 0000, 31 July, the maximum wind speed had decreased to 30 kn near 20.6°N, 133.4°W. Tropical Storm Gil crossed 140°W longitude and into the Central Pacific Hurricane Centers (CPHC) area of forecast responsibility shortly after 0000, 1 August.

HURRICANE HENRIETTE, 27 JULY - 6 AUGUST

As Tropical Storm Gil moved westward, north of Clipperton Island, the next cyclone of the season was beginning to develop as a tropical disturbance 190 mi south of the Guatemalan coast. Within 24 hr the disturbance showed cyclonic circulation and was upgraded to a depression. Turning slightly north of west and moving at 9 to 11 kn, the cyclone continued to intensify and was upgraded to tropical storm Henriette 18 hr later near 11.8°N 98.1°W. Winds reached 65 kn by 1800, 28 July, and the storm was upgraded to a hurricane near 12.5°N, 102.4°W or 310 mi south-soutwest of Acapulco. Turning slightly south of west, the cyclone continued to intensify, moving at 12-14 kn roughly along the same track as that of Hurricane Gil 96 hr earlier. Henriette passed 80 mi north of Clipperton Island at 0200, 30 July, and reached its maximum intensity of 115 kn 22 hr later near 12.0°N, 114.3°W. Figure 3 shows the hurricane, with a well-defined eye, southwest of the Mexican coast. Henriette continued to move west for another 12 hr, then turned west-northwest toward colder water. Moving 100-150 mi south of Gil's earlier track, Henriette weakened slowly. Winds were down to 55 kn over 23°C water by 0000, 4 August, and the cyclone was downgraded to a storm near 19.1°N, 133.2°W. Unlike Gil, which had moved west beneath an upper-level HIGH after crossing 130°W longitude, Henriette turned northwest, then north, toward a strong upper-level trough of low pressure off the Baja and California coasts. By 1200, 5 August, winds near the center had diminished to 30 kn over 22-23°C water and the storm was downgraded to a depression near 23.5°N, 137.5°W. High level clouds associated with the cyclone were carried northeastward across Northern California and Oregon by the upper-level trough off the West coast. The final advisory on the cyclone was issued at 0600, 6 August.

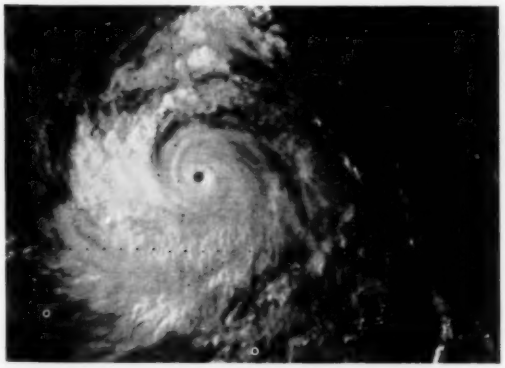


Figure 3.--Hurricane Henriette with a well defined eye and 115-kn winds at 2345, 30 July.

HURRICANE ISMAEL, 8-14 AUGUST

A northward bulge in the Inter-tropical Convergence Zone on 7 August began to generate the next cyclone of the season as a tropical disturbance 375 mi south-southwest of Acapulco. By 1800, 8 August, cyclonic circulation had developed and the disturbance was upgraded to a depression. Moving west-northwest at 15 kn, the cyclone intensified and was upgraded to tropical storm Ismael 6 hr later near 13.2°N, 107.6°W. The cyclone then turned northwestward. By 1800, 10 August, the winds near the center had increased to 65 kn and the storm was upgraded to hurricane Ismael near 18.4°N, 113.5°W or 75 mi east of Clarion Island. A report from the cargo ship SAGAMI MARU was helpful in locating the center of the cyclone. The first indication of an eye appeared near the center of the cyclone at 0245, 11 August. Nine hours later winds near the center reached

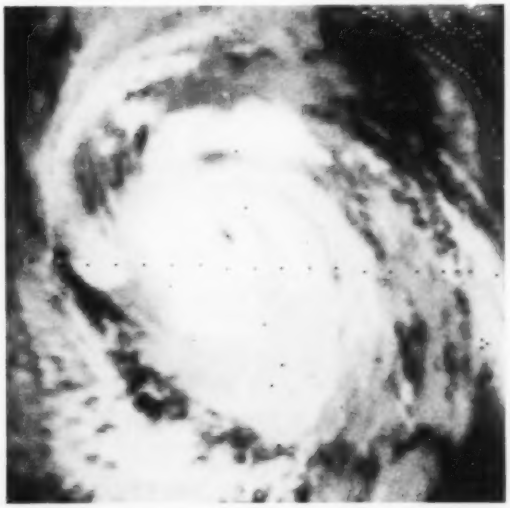


Figure 4.--Infra-red satellite image of hurricane Ismael southwest of the tip of Baja California at 1145, 11 August.

their maximum intensity of 85 kn near 20.5°N, 115.5°W. Figure 4, an infrared satellite image, shows Ismael near this position at 1145, 11 August. With a ridge of high pressure to the west and an upper-level trough of low pressure off the California coast, Ismael turned north-northwestward and, began to weaken slowly over cooler 26°C water. By 1800, 12 August, winds near the center were down to 60 kn and the hurricane was downgraded to a tropical storm 400 mi west of the tip of Baja California. Weather reports from the cargo ships TOYOTA MARU NO. 15, ASIAN WAY, AMSTELVAART, and SAGAMI MARU were an invaluable aid to the analyst. As Ismael moved up the west coast of Baja California, it began to pose a threat to Southern California and Arizona. Because of this, U.S. Air Force reconnaissance aircraft were requested to fly through the storm on the 13th and give an accurate fix on the center and an estimate of surface winds. The first flight located the center at 26.7°N, 118.4°W at 1725. Maximum surface winds were estimated at 35 kn 50 mi north of the center. The eye of the storm was described as poorly-defined and filled with clouds. A second pass through Ismael at 1935 fixed the center at 26.9°N, 118.4°W. Weather reports from the cargo ships VENUS DIAMOND and AMERICAN HIGHWAY helped to confirm this position. Maximum surface winds were now estimated at 25 kn 80 mi east of the center. Based on the reconnaissance reports and satellite imagery, Ismael was downgraded to a tropical depression near 27.4°N, 118.6°W. The cyclone turned north and weakened rapidly.

TROPICAL STORM JULIETTE, 24 AUGUST - 1 SEPTEMBER

Juliette began as a tropical depression 115 mi east-northeast of Clipperton Island on 24 August. Moving west-northwestward, the cyclone intensified slowly over 30°C water. By 0000, 26 August, the cyclone was 265 mi northwest of Clipperton Island near 13.7°N, 112.4°W. It then turned westward and, 18 hr later, was upgraded to a tropical storm near 13.9°N, 115.3°W. The cyclone continued to move west for another 6 hr, then turned northwest around the southwest side of an upper-level HIGH centered west of the tip of Baja California. Moving toward a strong upper-level trough of low pressure off the northern Baja and California coasts, the cyclone continued to intensify. Juliette reached her maximum intensity of 50 kn near 18.2°N, 119.1°W by 29 August. After reaching maximum intensity and with the trough off the west coast beginning to weaken, the cyclone turned west again. Four days after becoming a tropical storm, Juliette was downgraded to a depression near 18.8°N, 123.5°W. The cyclone then turned northwest again over colder water. The center dissipated rapidly 900 mi west of the tip of Baja California.

HURRICANE KIKO, 31 AUGUST - 9 SEPTEMBER

Hurricane Kiko formed in association with a tropical disturbance which passed across Central America on 26-27 August. The disturbance was upgraded to a tropical depression on 31 August. At that time, a well developed deep-layer HIGH was centered over New Mexico and was moving

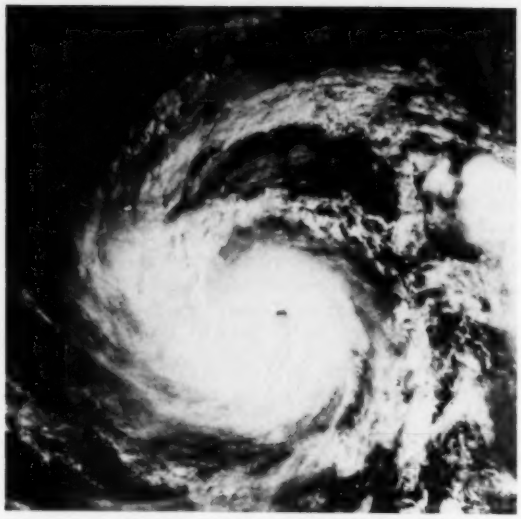


Figure 5.--Hurricane Kiko with 113-kn winds at 1516, 4 September.

southward. Deep-layer mean flow in the vicinity of the disturbance was light southeasterly. With sea-surface temperatures between 28° and 31°C the cyclone developed rapidly. Moving northwest, the depression was upgraded to tropical storm Kiko at 1800, 31 August, near 12.5°N, 102.0°W. Rapid development continued. By 1800, 1 September, winds near the center had reached 100 kn. This was followed by a slower increase in intensity to 125 kn by 1800, 3 September. Hurricane Kiko continued to move northwest, weakening slowly over cooler water. Figure 5 shows the cyclone southwest of the tip of Baja California at 1516, 4 September. Cooler sea-surface temperatures and increasing vertical wind shear associated with a subtropical jetstream caused a steady decrease in Kiko's strength. By 0000, 9 September, convective activity had ceased and the winds were down to 25 kn, and the final advisory on the cyclone was issued with the center dissipating rapidly near 25.0°N, 119.9°W. Weather observations from the ships NORSE MARSHAL, PECAN, PANGUEON, TRADE COURIER, EXXON NEWARK, EXXON JAMESTOWN, NICHIRIN MARU, ASIAN HIGHWAY, ADRIAN MAERSK, FORT NANAIMO, EASTERN MOON, and MIFUNEASAN MARU aided in analyzing and forecasting Kiko.

HURRICANE LORENA, 6-14 SEPTEMBER

As Hurricane Kiko moved west-northwestward off the tip of Baja California, the next cyclone was beginning to develop near the Gulf of Tehuantepec on the southern coast of Mexico. Moving slowly westward over 29°C water, the disturbance began to intensify and was upgraded to a depression 90 mi south of Acapulco on 6 September. Moving slowly westward, the cyclone intensified rapidly and was upgraded to tropical storm Lorena 12 hr later near 15.3°N, 100.5°W. Twenty-four hours later the winds were up to 65 kn and the storm was upgraded to a hurricane 135 mi southwest of Acapulco. It now turned west-northwestward and continued to intensify.

An eye was visible near the center of the cyclone on 7 September and the winds reached their maximum intensity of 100 kn by 1200, 8 September. Winds continued at 100 kn through 1800, 8 September, then decreased to between 80 to 90 kn as the cyclone moved west-northwestward. Winds remained at this intensity over the next 3 days as Lorena continued on a west-northwesterly track under an area of weak vertical shear and light east-southeasterly flow aloft. The cyclone began to diminish and by 1800, 12 September, they were down to 55 kn. Continuing to move west-northwestward over progressively colder water, the cyclone weakened rapidly. Low clouds to the west were also beginning to feed into the cyclonic circulation, further weakening the storm. By 1800, 13 September, winds were down to 30 kn and the cyclone was downgraded to a tropical depression. Weather observations from the cargo ships VENUS DIAMOND, GOLDEN LOTUS, AMERICAN LEGION, MELVILLE, AXEL JOHNSON, and tankers MOBIL ARCTIC, ATIGUN PASS, and LA PLATA MARU were helpful to the analyist and forecaster between 10 and 13 September. The final advisory on Lorena was issued on 14 September.

HURRICANE MANUEL, 12-20 SEPTEMBER

Between 10 and 12 September, a tropical disturbance with intense thunderstorm activity moved slowly westward south of the Gulf of Tehuantepec. Low-level cyclonic shear became evident on satellite imagery on 12 September. A deep-layer high pressure center was located over northwest Mexico, and remained quasi-stationary throughout the life of this cyclone. A weak stationary upper LOW was located between 130° and 140°W longitude off the southern California coast. Rapid intensification followed initial formation, and tropical depression 15 was upgraded to tropical storm Manuel at 1200, 12 September near 12.3°N, 100.1°W. With steadily increasing winds, Manuel moved west-northwestward and attained hurricane intensity at 0000, 14 September near 13.8°N, 105.9°W. The rate of intensification then slowed. At 1200, 16 September, Manuel turned northward. A small eye became visible at that time, then grew much larger and well-defined by 0600 on the 17th, (fig. 6). Winds were then estimated to be near 100 kn, the maximum attained by the hurricane. By 0000, 18 September, the eye had disappeared as Manuel moved over 25°C water. U.S. Air Force reconnaissance aircraft flew into Manuel at 2319, 18 September as the cyclone moved northward off the west coast of Baja California. The cyclone, however, had weakened to the point that no eyewall could be found, convective activity was mainly to the north of the center, and the winds had diminished to 40 kn. Manuel was downgraded to a tropical depression on 19 September. A second reconnaissance aircraft flew into the cyclone at this time and found only low-level clouds near the center. A subtropical jet stream northwest of the cyclone had sheared convective activity away from the center into the northeast quadrant. The center dissipated near 30.3°N 118.7°W. Weather observations from the cargo ships WAKAZURA MARU, NEDLLOYD, USSURIJSK, WILLOWBAND, CENTRAL, and MELVILLE were helpful in analyzing Manuel as the cyclone moved up the west coast of Mexico.

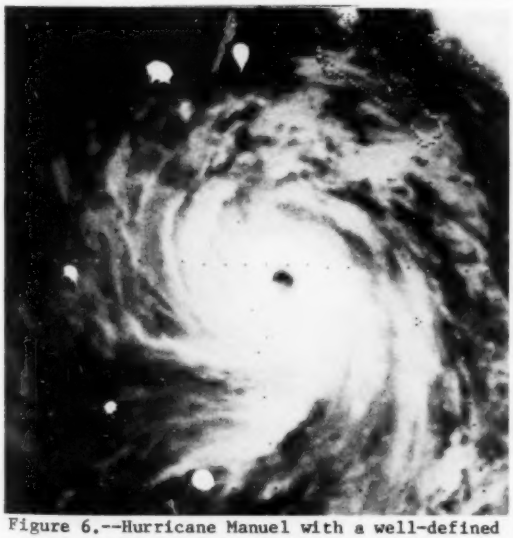


Figure 6.--Hurricane Manuel with a well-defined eye and 95-kn winds off the tip of Baja California.

TROPICAL STORM NARDA, 21-27 SEPTEMBER

The next cyclone of the season began to form as a tropical disturbance 225 mi south of Socorro Island 6 hr after the demise of Manuel. Moving west beneath the south side of an upper-level high pressure area centered over Baja California, the disturbance began to intensify over 29°C water. By 0000, 21 September the cyclonic circulation could be seen on satellite imagery and the disturbance was upgraded to a tropical depression. Six hours later the winds had increased to 35 kn and the cyclone was upgraded to tropical storm Narda near 15.2°N, 112.9°W. Narda continued to move west, reaching its maximum intensity of 50 kn at 1200, 23 September, near 15.9°N 121.5°W. Continuing on a track, slightly north of west, Narda began to move over colder water and weaken. By 26 September, the winds were down to 30 kn and the cyclone was downgraded to a depression near 16.5°N, 131.9°W. Narda moved across 140°W and into the CPHC's area of forecast responsibility at 1600, 27 September. After moving across 140°W longitude, the cyclone began to move over warmer water and reached tropical storm strength again by 0000, 28 September. Near 150°W longitude, the storm turned southwestward and intensified to 60 kn at 0600, 29 September. The cyclone then began to weaken and the final advisory was issued on 1 October with the center near 14.8°N 161.2°W.

TROPICAL STORM OCTAVE, 27 SEPTEMBER - 2 OCTOBER

The 17th cyclone of the season was initially associated with a tropical disturbance located south of the Gulf of Tehuantepec on 23 September. A deep layer HIGH was then centered over central Mexico and a stationary upper LOW was located near 125°W longitude off the central California

coast. This pattern continued throughout the life of the cyclone. The disturbance moved west for 4 days before being classified a tropical depression near 11.8°N, 118.3°W. Sea-surface temperature along the route was in the 28° to 29°C range, but vertical wind shear of 10 to 15 kn slowed development. The cyclone then turned northward, under the influence of the upper LOW to the northwest. Winds increased to 40 kn by 1800, 28 September, and the depression was upgraded to tropical storm Octave near 13.5°N, 121.7°W. By 0000 on the 29th, they were at their maximum intensity of 45 kn near 14.2°N, 121.9°W. Forward movement slowed for the next 30 hr as the storm curved toward the northeast. Octave accelerated to the northeast and weaken over colder water and beneath an area of increasing southwesterly flow aloft. Octave dissipated near 24.0°N 117.3°W. Weather observations from the cargo ship MORAY-BANK were helpful in locating the center of the cyclone.

HURRICANE PRISCILLA, 30 SEPTEMBER - 7 OCTOBER

Midway through the lifespan of Octave, the next cyclone formed 250 mi east of Clipperton Island on 29 September. Moving west-northwestward, the disturbance intensified and was upgraded to a depression on the 30th 90 mi northnortheast of Clipperton Island. Twenty-four hours later the cyclone was upgraded to tropical storm Priscilla near 12.7°N, 111.6°W. Moving beneath the southwest side of an upper-level HIGH centered over the west coast of central Mexico, the storm continued to move west-northwest and intensify. By 3 October, the winds then reached 65 kn and the storm was upgraded to Hurricane Priscilla 400 mi southwest of Socorro Island. Twenty-four hours later the cyclone reached its maximum intensity of 100 kn near 15.1°N, 118.1°W. Figure 7, an infrared satellite image, shows Priscilla with a well-defined eye near this position at 0245, 4 October. The hurricane now turned north toward a strong upper level trough sharply orientated northeast-southwest across Southern California and offshore waters. Priscilla's winds remained at 100 kn through 1200 on the 4th, then began to slowly diminish as the cyclone moved toward progressively colder water. By 6 October, her winds were down to 55 kn and the cyclone was downgraded to a storm. Twelve hours later they were at 30 kn and the storm was downgraded to a depression near 24.9°N, 120.9°W. Priscilla moved north for another 6 hr, then turned north-northeastward and dissipated 170 mi southwest of Guadalupe Island on 7 October. Weather reports from the cargo ships SUNBELT DIXIE and SAGAMI MARU were helpful in locating the cyclone as it dissipated southwest of Guadalupe Island.

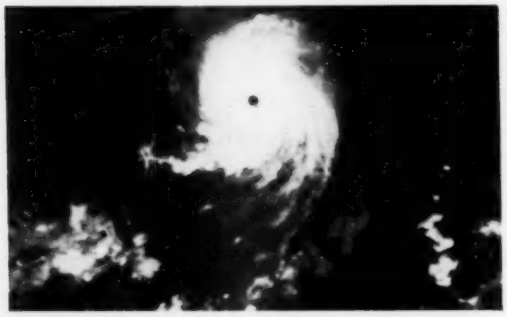


Figure 7.--Infra-red satellite image of hurricane Priscillla with 100-kn winds and well-defined eye near 15.3°N, 118.2°W at 0245, 4 October.

HURRICANE RAYMOND, 8-14 OCTOBER

A tropical wave, later to become hurricane Raymond, passed into the Pacific from Nicaragua on 5 October and moved westward. At this time, a deep-layer HIGH center was over Mexico and a well-developed ridge line extended westward toward the Hawaiian Islands. On 8 October, infrared satellite imagery showed increasing cyclonic shear over the disturbance, and the first advisory on the cyclone was issued. The depression moved due west, south of the mean ridge line, and over very warm 29-30°C water. Intensification to tropical storm occurred by 0000, 9 October, near 12.3°N 106.4°W. Tropical storm Raymond continued moving westward, accelerated and intensified. By 1200, 10 October, the winds had reached 65 kn and the storm was upgraded to a hurricane near 12.0°N, 114.6°W. Raymond was now moving west and a small but distinct eye had become visible near the center. Raymond then began to intensify rapidly (fig. 8). Twenty four hours later, the cyclone reached its maximum intensity of 125 kn near 12.4°N, 121.2°W. Raymond then turned westnorthwestward. With sea-surface temperatures remaining above 27°C, Raymond moved across 140°W longitude with 110-kn winds shortly after 0600 on 14 October. After crossing 140°W longitude, the CPHC assumed responsibility for the issuance of advisories on hurricane Raymond. For a time, it appeared Raymond might pose a threat to the Hawaiian Islands but after reaching 145°W longitude, the cyclone stalled for a short time, then turned northeastward and dissipated over colder northern waters.

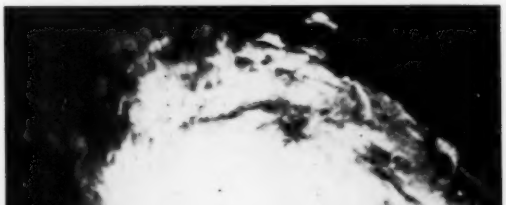


Figure 8.--Hurricane Raymond with 117-kn winds and small but well defined eye.

TROPICAL STORM SONIA, 9-12 OCTOBER

On nearly the same latitude as Raymond, and 1200 mi to the west, tropical storm Sonia began as a tropical disturbance on 8 October. Moving west-northwest the disturbance began to show cyclonic circulation on the 9th and was upgraded to a depression near 13.4°N, 130.2°W. Winds

increased to a maximum intensity of 35 kn 6 hr later and the cyclone was upgraded to tropical storm Sonia. Sonia continued to move west-northwest for another 12 hr, then turned westward. A weather observation from the cargo ship RESURGENCE EXPRESS was helpful in locating the cyclone. Although the cyclone was moving over relatively warm 28°C water, upper-level wind shear associated with a strong upper-level trough approaching from the west was weaking the storm. By 11 October, Sonia's winds were down to 30 kn and the cyclone was downgraded to a depression near 14.6°N, 135°W. Sonia then turned slightly south of west and weakened rapidly.

HURRICANE TICO, 11-19 OCTOBER

On 7-8 October, a weak tropical disturbance moved into the Pacific from Costa Rica. This disturbance moved westward slowly and began to intensify as it neared the 30°C isotherm near 100°W longitude. On the 11th this disturbance was classified as the 21st cyclone of the season near 8.5°N 100.4°W. It moved slowly west-northwestward, then turned abruptly northward, steered by a vigorous trough which had recently moved southeastward into Mexico. The cyclone was upgraded to tropical storm Tico at 0000, 13 October, near 11.2°N, 102.9°W. Tico moved northward and continued to intensify. A NOAA reconnaissance aircraft flew into the storm at 2100, 13 October, and found an open, circular eyewall with a diameter of 12 mi. On 14 October, the winds had increased to 75 kn. The cyclone then turned northwestward. This change in direction was most likely caused by a ridge that extended west-northwest from Guadalajara, and intensified as the trough over Mexico moved

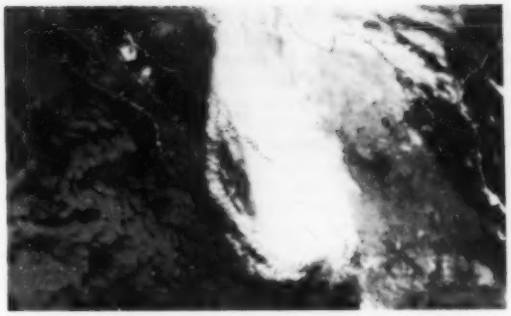


Figure 9.--Hurricane Tico just before moving inland over Mazatlan with 110-kn winds.

eastward. Tico gradually turned west and intensified to 100 kn by 17 October. On the 18th, Tico began to recurve in response to another trough which was then digging southeastward over northern Baja California. By 1800 the same day, Tico was moving northeastward and accelerating with winds peaking at 115 kn shortly thereafter. Tico hit the Mexican mainland very near Mazatlan at 1500, 19 October. This hurricane caused extensive damage around the port of Mazatlan. Nine fishermen were killed, and nine small ships were sunk. There were 105 people reported missing and 25,000 people were left homeless. Extensive flooding occurred in the area. Nearly 19,000 acres of beans and maise were destroyed in Sinaloa State, mainly to the south of Mazatlan. Total damage was estimated near $66 million. The remnants of Tico moved rapidly northeastward, causing

Figure 10.--Some of the results of hurricane Tico stricking Mazatlan. Nine small ships were sunk, 9 fishermen were killed, over 100 people missing, thousands homeless, and thousands of acres of crops destroyed. Wide World Photo.

extensive flooding over north Texas, Oklahoma, and southern Kansas. Rainfall in excess of 11 in was reported. Figure 9 shows Tico, with a well-defined eye, near the Mexican coast at 1315, 19 October. Many ships sent weather observations which were of great value in following Tico. Among them were the cargo ships NEDLLOYD NAPIER, PANAMA MARU, USSURIJSK, ALKMAAR, CALIFORNIA STAR, VERRAZANO BRIDGE, and the passenger liner ISLAND PRINCESS. The container ship SCANDINAVIAN HIGHWAY passed very near the storm center and sent reports of special value. Figure 10 shows ships that were blown aground at Mazatlan.

TROPICAL STORM VELMA, 1-3 NOVEMBER

Tropical Storm Velma was a late season, short lived cyclone which began as a disturbance on the Inter-Tropical Convergence Zone. The disturbance moved west past 95°W longitude at 7°N latitude, a rather unfavorable location for tropical cyclone development. Even so, when the disturbance passed 100°W longitude and moved over 29°C water, cyclonic organization appeared on satellite imagery. Moving west the depression was upgraded to tropical storm Velma 6 hr later near 7.9°N, 101.6°W. Winds were estimated at 35 kn and remained at that intensity for the next 18 hr. The cyclone then began to weaken and was downgraded to a depression at 1800, 2 November, near 8.2°N, 103.8°W. The final advisory was issued 12 hr later with the center dissipating 270 mi east-southeast of Clipperton Island.

HURRICANE WINNIE, 4-7 DECEMBER

Although records indicate that eastern North Pacific tropical cyclones have occurred during the month of December, Winnie was the first such cyclone to have that distinction since prior to 1947 (Rosendal, 1962). The cyclone began as a disturbance 330 mi south-southwest of Acapulco on 3 December. Moving northwest, the disturbance intensified and was upgraded to a depression at 1200 GMT 4 December near 12.9°N 102.9°W. On the 5th the cyclone turned north-northwest and was upgraded to tropical storm Winnie near 14.5°N, 104.3°W at 0000, 5 December. A weather report from the cargo ship AMERICAN MERCHANT helped to locate the center of Winnie at this time. Winnie then turned northward beneath the southwest side of an upper-level HIGH. By 0000, 6 December, the winds had increased to 70 kn and the storm was upgraded to a hurricane near 17.0°N, 104.1°W. Now situated in a cool area between upper-level high pressure areas over the Yucatan Peninsula and southwest of Baja California, the cyclone remained nearby stationary 130 mi south of Manzanillo, and reached its maximum intensity of 80 kn. Figure 11 shows Winnie, with a well-defined eye. Winds continued at 80 kn through 1200, 6 December, and then began to diminish with the approach of an upper-level trough and increasing vertical shear aloft. Weather reports from the cargo ship AMERICAN LYNX were helpful in analyzing Winnie during this period. On the 7th the winds were down to 55 kn and the hurricane was downgraded to a storm near the quasi-stationary position of 17.0°N, 104.1°W. Twelve hours later they had diminished to 25 kn and the cyclone was downgraded to a depression.

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Rosendal, Hans E., 1962: Eastern North Pacific Tropical Cyclones, 1947-1961. MARINERS WEATHER LOG, V . 6, No. 6, p. 195-201.

Figure 11.--Infra-red satellite image of Hurricane Winnie with 80-kn winds off the south coast of Mexico.

CENTRAL NORTH PACIFIC TROPICAL CYCLONES, 1983

Central Pacific Hurricane Center
National Weather Service, NOAA
Honolulu, Hawaii

The central Pacific had two tropical depressions form within the Central Pacific Hurricane Center (CPHC) area of responsibility. Three tropical storms and one hurricane moved westward across 140°W longitude from the Eastern North Pacific area. Table 5 lists the seasons statistics. Figure 12 shows the tracks of the cyclones in the Central North Pacific area. Complete tracks are shown in the Eastern North Pacific annual article on page 67.

Table 5.--Central North Pacific Tropical Cyclone data, 1983

Cyclone Number	Name	Dates	Intensity	Maximum Winds (kn)
1	Gil	Aug. 1-5	TS	45
2	TD-1C	Aug. 19-20	TD	30
3	TD-2C	Aug. 30-31	TD	30
4	Narda	Sept. 27-30	TS	60
5	Raymond	Oct. 14-20	HU	120
6	Sonia	Oct. 11-14	TS	40

HU = Hurricane, TS = Tropical Storm, TD = Tropical Depression

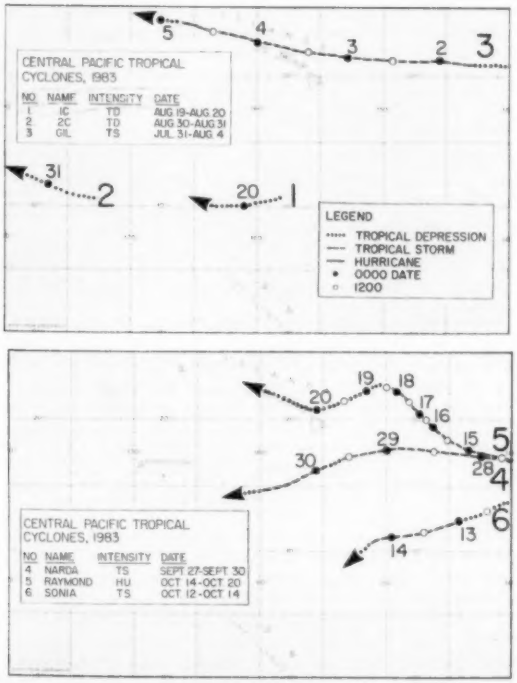


Figure 12.--Central North Pacific tropical cyclone tracks.

TROPICAL STORM GIL - AUGUST 1-5, 1983

Gil crossed 140°W into the Central Pacific Hurricane Center's (CPHC) area of forecast responsibility as a tropical depression with 30-kn sustained winds on August 1. Gil, only 3 days earlier near 15°N, 120°W, had been a hurricane but had weakened as it transversed the cooler waters between 120°W and 140°W. Gil, therefore, still possessed a well developed low-level circulation as the CPHC took over and issued the first advisory on it at 0600, 1 August for a fix near 21°N, 141°W.

A slow, gradual strengthening was indicated as Gil moved west-northwestward over the slightly warmer waters west of 140°W, and Gil once again became a tropical storm at 1800 on the 1st. Gil continued along a very regular track, crossing 155°W near 21.7°N at 0900 on the 3d, approaching the Hawaiian Islands from the east and heading in the general direction of Kauai. Gil strengthened slightly with winds estimated at 40 kn as he approached the islands of Kauai and Oahu. The closest point of approach (CPA) to Oahu was 30 mi north of Kahuku Point at 1800. CPA to Kauai was 10 mi north of Kilauea Point at 2200.

Air Force reconnaissance flights into the storm confirmed wind speeds of 40 to 45 kn within the northern semicircle. To the south of the center, over the islands of Oahu and Kauai, winds remained light, ranging from near calm to light southwesterly. Central sea-level pressure was measured at 1011 mb.

There was little or no damage on the Islands as a result of Gil's close passage. A few localized heavy showers did occur mainly over Kauai, and heavy surf pounded the east and northeast shores of Kauai and Oahu indicative of the much stronger winds offshores to the north of the center. Several small craft transiting between the West Coast and the Islands did experience minor difficulties. There may have been one casualty. A 19-ft catamaran named HURRICANE with a crew of two left Long Beach on July 20 and had an estimated time of arrival at Honolulu of August 1. The vessel was still classified by the U.S. Coast Guard as missing at the end of August and is presumed to be a casualty of the storm. However, reports indicate that the vessel left port without radio equipment so no one had any idea where the vessel was once it left Long Beach. The vessel could have run into difficulties off the California coast.

After passing Kauai and now in a weakening trend, Gil continued west-northwestward up the leeward island extension of the Hawaiian chain. Gil passed just south of French Frigate Shoals at 2000 on the 4th as a minimal tropical storm. No strong winds were reported on the automatic weather instruments on that small island as winds changed from northeasterlies gusting at 26 kn to southeasterlies with the lowest hourly

pressure reading at 1014 mb.

At 0000 5 August Gil was downgraded to a tropical depression near 24°N, 168°W. The remnant circulation, along with some heavy thunderstorms, passed about 150 mi south of Midway Island into the western Pacific late on the 6th and early on the 7th.

TROPICAL STORM NARDA, SEPTEMBER 27 - 30

Narda entered the Central Pacific Hurricane Center's (CPHC) area of forecast responsibility on September 27 classified as a tropical depression with maximum sustained winds estimated at 30 kn. Narda had been a tropical storm a few days earlier and had weakened on crossing the cooler waters between 120°W and 140°W. Narda was following a westerly track along 17°N. This was a track somewhat farther south than the paths followed by previous weakening systems which had entered the CPHC area earlier this season. Narda, therefore was moving over slightly warmer waters more favorable for redevelopment and along a track which posed more of a threat to the Hawaiian Islands.

Narda, according to satellite data, commenced to intensify upon crossing 140°W. At 1800 on the 27th, when the first CPHC advisory was issued for a location near 17°N, 141°W, NARDA was once more classified as a tropical storm with maximum sustained winds of 35 kn and gaining strength. Narda was moving at a forward speed of about 20 kn on a bearing of about 275° to 280°. Air Force reconnaissance into the storm at 0300 and 0600 on the 29th found that maximum sustained winds had increased to 60 kn. The reconnaissance report also indicated that an eye had developed which confirmed that Narda was close to attaining hurricane strength. Narda at this time was located about 300 mi southeast of Hilo, Hawaii near 18°N, 151°W.

During the nigth of September 28, Narda showed signs of weakening and of curving southwestward as if deflected by the terrain of the Big Island of Hawaii and being embedded in a rather shallow steering flow. Daylight satellite imagery and aerial reconnaissance data confirmed this diminished threat to the Hawaiian Islands. The center of Narda passed about 150 mi south of South Point, Hawaii at 0000 on the 30th with maximum sustained winds of 45 kn close to the center. The last advisory ar a weakening tropical depression, was issued for the 0000, October 1 position near 15°N, 161°W.

The effects of tropical storm Narda on the Hawaiian Islands were minor and consisted mainly of higher than normal surf along the east and southeast facing shores. No known casualties to shipping occured.

HURRICANE RAYMOND, OCTOBER 14-20

Raymond was a large and powerful hurricane with 110-kn sustained winds as the Eastern Pacific Hurricane Center (EPHC) in San Francisco handed over forecast responsibility to the CPHC near 17°N, 140°W at 0900 October 14. Raymond during the previous 24 to 48 hr had been moving rapidly west-northwestward at a constant speed of 15 to 20 kn aiming straight at the Hawaiian Islands. At this forward motion speed of about 6 to 7 degrees longitude per day this large storm had the potential of affecting the Hawaiian Islands in only 36 to 48 hr after its center crossed 140°W. There was therefore great concern as RAYMOND showed no signs of weakening but rather indicated a slight strengthening with maximum sustained winds of 120 kn and gusts to 145 kn at 1800 on the 14th.

Raymond now rivalled in strength such historical central North Pacific hurricanes as Celeste of 1972 and Fico and Susan of 1978. Raymond, according to satellite imagery, showed an unusually large and well-defined eye and a very symmetric, circular circulation embedded in deep and moist easterlies.

During the night of October 14-15 HST Raymond slowed its forward motion considerably and started moving on a slightly more northerly course, and the large-clear eye started to become fuzzy in the nighttime infrared satellite imagery as the symmetric shape of the hurricane became more elongated along a north-south axis. Raymond was starting to feel the effects of the upper westerlies developing out ahead of an approaching trough to the northwest of the storm.

It had now become apparent that Raymond was going to move north of the Big Island of Hawaii. This, together with the now obvious weakening trend meant that there was less of a threat to the Hawaiian Islands. This weakening trend was confirmed by an Air Force reconnaissance plane which checked on the storm on its way to the Islands from the West Coast. It reported flight-level winds at 10,000 ft in the 60 to 70 kn range and an extrapolated sea-level pressure value in the center of 968 mb at 0443 on the 15th. This pressure value statistically would indicate maximum sustained winds near 90 kn for a tropical cyclone in the CPHC area.

The shearing stress on Raymond caused by southwesterlies aloft pulling the storm northeastward while the low-level trades were pulling westward, together with drier air entering the circulation, was now taking its toll, and the weakening developed a substantial vertical tilt and a quite loose and asymmetric circulation. The differential pull also caused Raymond to slow its forward motion to about 5 to 10 kn.

Daylight reconnaissance investigation at 1635 on the 15th found the center of Raymond near 19°N, 146°W with surface winds estimated near 80 kn. At 2 pm HST or 160000 GMT Raymond was downgraded to tropical storm strength. Raymond maintained a very slow northwestward drift performing several loops over the next 24 to 36 hr while weakening further. At 1800 on the 18th near 22°N, 151°W Raymond was downgraded to depression status and had lost its deep convection. It was now moving slowly westward or west-southwestward within the trade flow toward the Islands.

Raymond, as a weak depression, moved through the Hawaiian chain near Molokai at 1200 on the 20th bringing beneficial rains mainly in the 1 to 2-in range from Maui northward and some locally gusty winds to all islands. Gusts from a westerly direction in the 35 to 45 kn range were reported on the Big Island during the afternoon of the 19th, but no damage was reported. As

Raymond emerged to the lee of the Islands over Oahu and Kauai it had pretty well dissipated. Other effects on the Hawaiian Islands were limited to high surf in the 10 to 15-ft range along the Kalapana and Kaimu Beach areas on the east coast of the Big Island of Hawaii and at Hana, Maui. This surf did only minor damage and started to arrive at 2100 on the 15th about 37 hr after Raymond's center crossed 140°W. No marine casualties occurred, though the fishing vessel CRESCENT, according to a report from the Coast Guard, lost some of her rigging and issued a Mayday as the vessel encountered 60 kn winds about 180 mi from Raymond's center.

TROPICAL STORM SONIA, OCTOBER 11-14

Sonia moved into the CPHC area around 1200 on October 11 classified as a weak tropical disturbance. It had been downgraded 24 hr earlier from tropical storm to tropical depression status near 15°N, 135°W, and subsequently further downgraded to a tropical disturbance as there was no sign of a closed circulation when near 14°N 139°W. Sonia was carried in the marine bulletins as a tropical disturbance while moving west-southwestward at about 10 kn over increasingly warmer waters to the southeast of the Hawaiian Islands. Encountering more favorable upper-flow conditions, Sonia gradually regained strength, and at 0000 on the 13th, near 12°N, 144°W, maximum winds were estimated to have reached tropical storm intensity of 35 kn, and the CPHC commenced issuing advisories on tropical storm Sonia.

Sonia gradually assumed a more westerly path roughly along 11°N and at 0000 on the 14th, was estimated to have 40 kn maximum winds around its center. Late season storms located in this particular area are definitely a threat to the Hawaiian Islands, so the CPHC was closely watching Sonia. Sonia, however, was a small and not very well-organized storm. It was now starting to feel the influence of the much larger and more intense Raymond which was moving rapidly westward about 600 mi to the northeast. The close proximity to Raymond caused Sonia to gradually weaken, slow its forward motion and merge into the convection cloud bands feeding into Raymond from the southwest. The last advisory on Sonia was issued at 1800 on the 14th with the storm rapidly falling apart near 10°N, 151°W.

Mariners Weather Log

EL NINO-SOUTHERN OSCILLATION EPISODE OF 1982-83

Celso S. Barrientos
Assessment and Information Services Center
National Environmental Satellite, Data,
and Information Service
Washington, D.C.

About the end of the year, a weak southward-flowing warm ocean current develops along the coast of Peru and Ecuador. Because it comes near the Christmas season, the local residents call it "El Nino," "The Child," referring to the Christ child. At intervals that vary from 2 to 10 yr, a greater than normal rise in sea-surface temperature (SST) occurs and the trade winds become unusually weak over the tropical Pacific Ocean. The name El Nino is now used to refer to this unusual warming in the equatorial Pacific, even though it has become apparent that the physical processes associated with them are quite different from those of the weak annual event.

El Nino-Southern Oscillation (ENSO) can be broadly described as an anomalous oceanic and meterological event characterized by the sudden appearance of abnormally warm surface water on a scale of a thousand kilometers off Peru and Ecuador. ENSO events devastate the ecology of the coastal zones of Peru and Ecuador, affect the global atmospheric circulation, and may contribute to severe winters over North America. Its economic impacts are significant: catastrophic financial losses for the local fisheries (Peru and Ecuador), significant reduction of local fertilizer industry, and worldwide economic repercussions on fish mill industry, soybean production, and beef and poultry prices.

CHARACTERISTICS OF EL NINO-SOUTHERN OSCILLATION

Under normal, non-episodic conditions, the trade winds from the northeast and southeast in the tropical eastern Pacific converge in the central Pacific near the Equator and move westward toward Indonesia. This normal flow of air drags the surface water westward, resulting in a buildup of sea level in the western Pacific and a lowering in the east. It also creates a deeper thermocline in the west and shallow or complete disappearance of upper warm (water) mixed layer in the eastern Pacific. When the cold deep water off the coast of Peru and Ecuador upwells to the surface to replace the coastal waters carried westward, it carries with it nutrients from the ocean bottom that nourish the biological community in that part of the world.

During an ENSO episode the following happen:

1. Large-scale weakening of the southern hemisphere trade wind system beyond the normal seasonal weakening at that time (around December);
2. Cessation of upwelling along the Peruvian and Ecuadorian coasts:
3. The sudden appearance of anomalously warm and low-salinity surface water for thousands of square kilometers off the coasts of South America; and
4. Southward extension of this warm water mass far beyond its usual summer boundary.

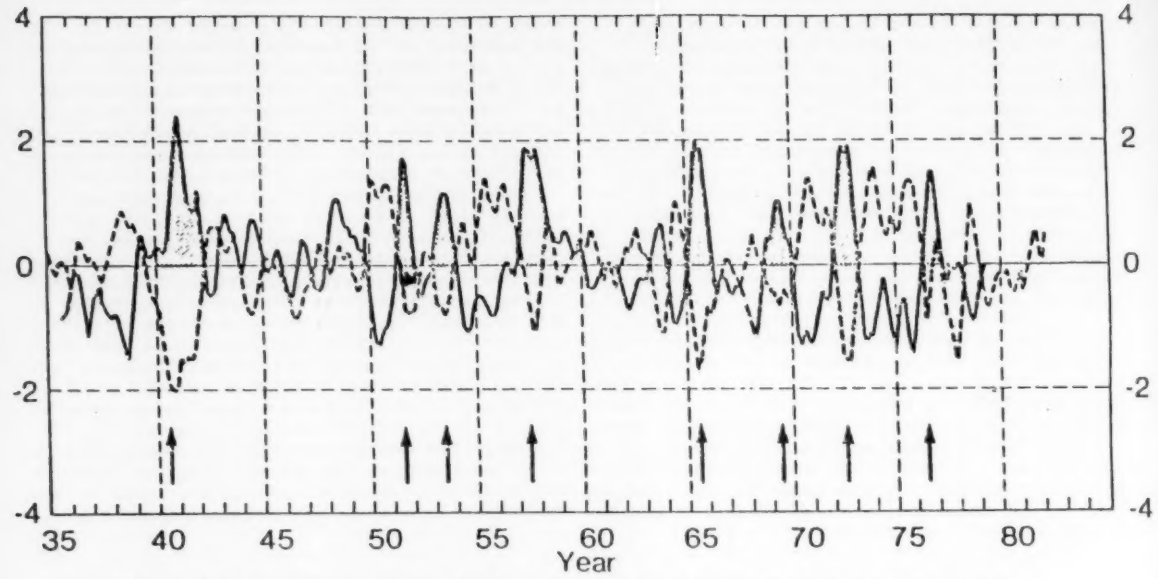


Figure 13.--A comparison of the Southern Oscillation Index, SOI (dashed line) and the SST at Puerto Chicama, Peru (solid line). The SOI is represented by the atmospheric pressure difference between Tahiti and Darwin, Australia. Vertical arrows indicate El Nino events.

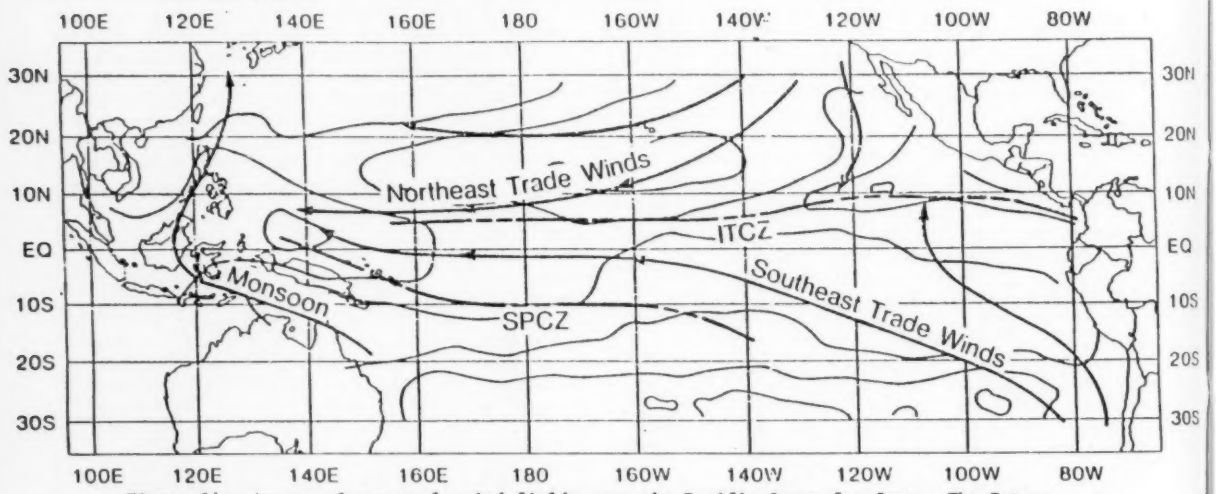


Figure 14.--Average large scale wind fields over the Pacific Ocean for June. The Intertropical Convergence Zone (ITCZ) is a zone of heavy precipitation which separates the northeast and southeast trade winds. Similarly, the South Pacific Convergence Zone (SPCZ) separates the monsoon flow of the Southwest Pacific and the southeast trade winds.

There are some interesting physical questions about ENSO: 1) what are the precursors? 2) what are the initiating mechanisms? 3) where is the source of the warm water? and 4) what are the dynamics of the communication between the eastern Pacific and equatorial circulation, and between the tropics and the temperate regions? When we gain understanding of these physical aspects then we might develop a capability in predicting ENSO.

Sir Gilbert Walker, a British meteorologist, was the first to study ENSO during the 1920's in relation to predicting the onset of monsoons in the Indian continent. Walker devised a Southern Oscillation Index (SOI) which is the difference in sea level pressure between Tahiti and Darwin. During ENSO episodes, SOI is largely a negative number, i.e., the atmospheric flow is westerly. Figure 13 is a comparison of the SOI (dashed

line) and the SST at Puerto Chicama, Peru (solid line). The vertical arrows in the figure indicate ENSO events. Close correlation between the Index (SOI) and the warming (SST) is evident.

Figure 14 shows the average large-scale wind field over the Pacific Ocean for June. The Intertropical Convergence Zone (ITCZ) is a zone of heavy precipitation which separates the northeast and the southeast trade winds. Similarly, the South Pacific Convergence Zone (SPCZ) separates the monsoon flow of the southwest Pacific and the southeast trades. Under normal conditions, the northeast trades intensify during winter, thus shifting and weakening the southeast trades causing the warm ocean current flow off the coast of South America around December-January period. Figure 15(top) is the winter seasonal mean of the jet stream. The heavy isoline is 30 meters per second. The jet stream during the 1982-1983 winter is represented in the bottom of Figure 15. It is stronger and the position is shifted more southward in North America.

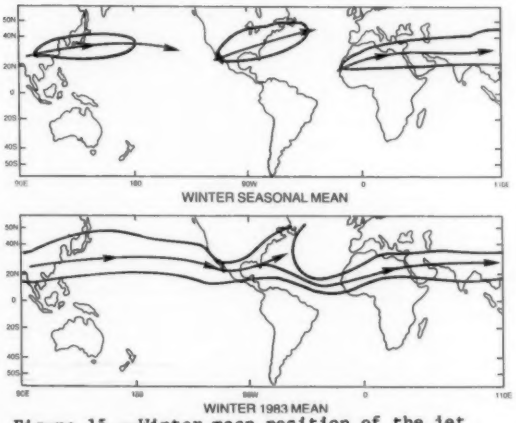


Figure 15.--Winter mean position of the jet stream. Isolines = 60 meters per second.

THE 1982-1983 ENSO EPISODE

Indications of an ENSO-like episode were noticed in May-June 1982. Since it was the wrong time of the year for ENSO, it was not immediately suspected of being an event. However, by September 1982, it was clear that an ENSO was developing. The Climate Analysis Center (CAC) of NWS issued their first El Nino bulletin at that point.

Figure 16 is a time history of the Tahiti minus Darwin sea level pressure SOI. The curves represent five month averages from 1978 to the present episode. ENSO episodes are clearly indicated--1969, 1972, 1976-77, and 1982-83. The present episode is the strongest of the recent records. Another measure of ENSO intensity is the strength of the easterly winds. Figure 17 shows the time history of the average easterly wind speed over the Equatorial Pacific between 135°E and 170°W, and between 5°S and 5°N. During ENSO episodes the average wind is westerly or negative. Similarly, the 1982-83 is indicated as the strongest.

The warm water in the equatorial Pacific became discernible in May 1982. The area of relatively

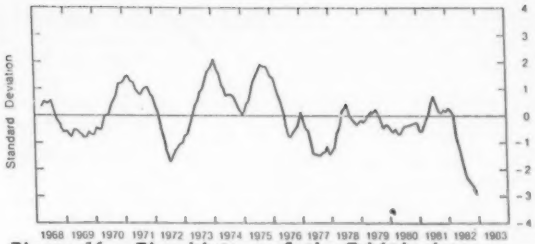


Figure 16.--Time history of the Tahiti minus Darwin atmospheric pressure (SOI) at sea level. The curve represents 5 month averages.

warm water slowly expanded eastward and the degree of warming increased. By September 1982, the warming had reached the coast of South American and the areal extent more than half of the Pacific. Figure 18 shows the sea surface temperature (SST) map for December 1982. The peak of the warming was reached during the December 1982-January 1983 period when the SSTs were observed to be 4°C to 6°C above normal.

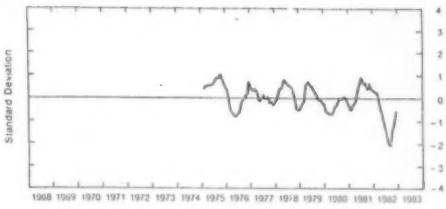


Figure 17.--Time history of the average easterly wind speed over the Equatorial Pacific in the area between 135°E and 170°W, and between 5°S and 5°N. The large negative peak in 1982 actually resulted in a change to westerly winds.

WORLDWIDE IMPACTS OF EL NINO

El Nino here also refers to the Southern Oscillation. The 1982-1983 ENSO episode is probably best described as more of a Southern Oscillation event. Southern Oscillation is a phenomenon characterized by the large scale swaying of an atmospheric mass between the Pacific and Indian Oceans. The oscillation impacts both the Northern and Southern Hemispheres, causes shifts of major weather systems, and is accompanied by:

a) significant changes in the tropical and subtropical wind systems;
b) shifts in planetary wave systems;
c) changes in jet stream position;
d) large changes in rainfall patterns in the monsoon regions and in the western equatorial Pacific; and
e) changes in the equatorial current systems and heat content of the Pacific Ocean.

All the above major shifts and changes have caused catastrophic weather events in various parts of the world, such as, drought in the western Pacific region (Australia, Philippines, and Indonesia) and excessive rainfall in the western Pacific area (Peru and Ecuador).

The Assessment Information Services Center,

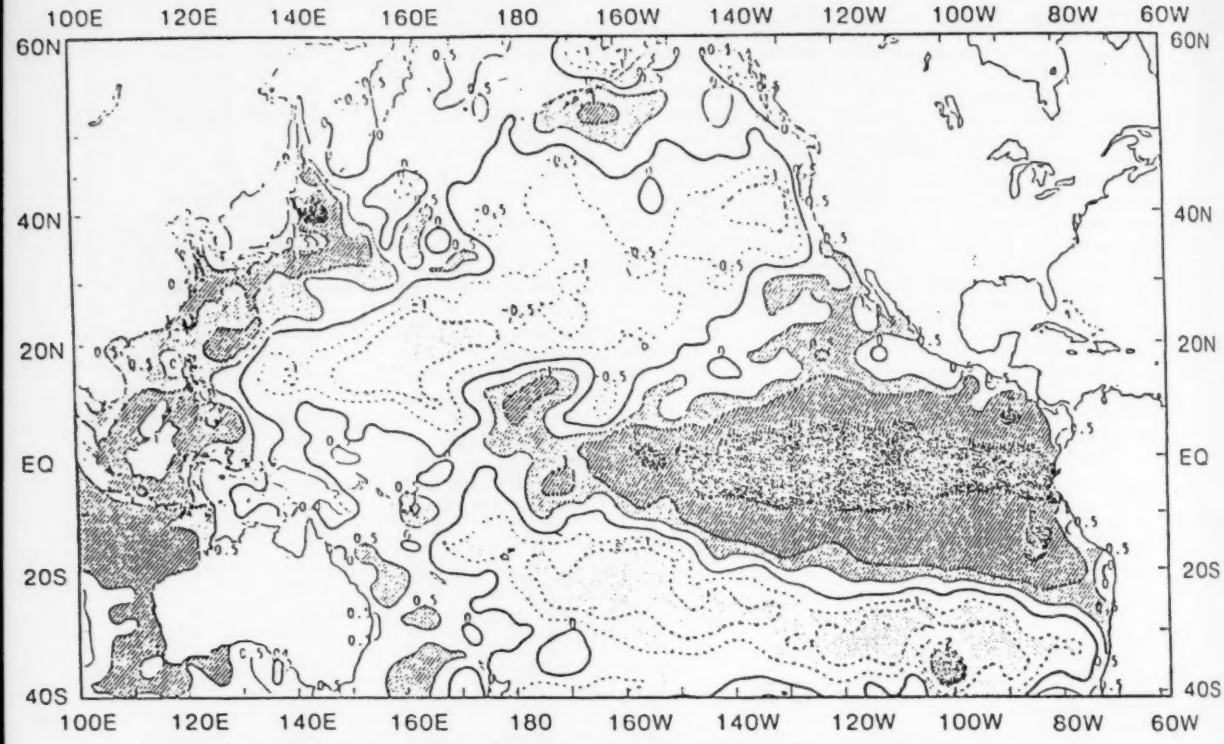


Figure 18.--Pacific Ocean SST anomalies for December, 1982 (NCC Climatology). The progressively darker dotted areas indicate negative SST anomalies greater than 0.5°C, 1.0°C, and 2.0°C respectively. The progressively darker lined areas indicate positive SST anomalies greater than 0.5°C, 1.0°C, and 2.0°C respectively.

NESDIS, NOAA has been involved in assessing weather and climate impacts on the various sectors of the economy. When NOAA began to look into this El Nino event in early March 1983, we went back to our assessment publications and examined more closely the abnormal weather events since the summer of 1982. We worked closely with other physical scientists in NOAA to relate the abnormal climate/weather events with ENSO.

We began publishing our climate impact assessments in 1977. We took the average number of events during a 5-year period (1977-1981) and compared the monthly average with the number of events associated with the present ENSO episode. Beginning in August 1982 the monthly number of events is consistently higher than the 5-year average. The biggest difference in the numbers are in January 1983--12 vs. 4. The monthly average for the nine months (August 1982 to April 1983) is about twice as much as the 5-year monthly average without identifiable Los Ninos. Every year there are unusual weather events (droughts or floods, severe storms, and more or less hurricanes) with or without ENSO. Whether we can relate any or how many of these recent events to the recent ENSO episode is not simple. There are still more studies that need to be done.

There were about a dozen major weather/climate events in 1982-1983. There is still controversy whether all of these events are associated with ENSO. Worldwide damages from these events totaled about $8 billion and about 1,000 lost of lives. These damages are significant considering that more of them occurred in developing countries.

Analyses of this 1982-1983 ENSO episode are continuing in the government and universities. We are relating the physical data and the economic information. Since this is an intense episode, we hope to gain considerable knowledge from the various studies. Ultimately, we would like to be able to predict ENSO episodes and to devise management and planning strategies to minimize the adverse impacts.

Acknowledgments: The original information utilized in the charts used in this article originated from the Climate Analysis Center, NWS from the group led by Dr. Eugene Rasmusson. I am deeply grateful for being able to work with them.

Marine Observations Program

MARINE OBSERVATIONS PROGRAM
J. W. Nickerson
National Weather Service
Silver Spring, Maryland 20910

PMO CONFERENCE APRIL 17-19

If you couldn't find a Port Meteorological Officer (PMO) that week, they were all at a Marine Observation Program Conference at the National Weather Services Headquarters in Silver Spring, Maryland. As we coordinate with Canada, three of their marine people also attended the MOP/PMO conference. We have these conferences every couple years to standardize our procedures and make sure we are responding properly to the mariner's requirements.

Even though the number of ships at sea has decreased considerably over the last several years, through the hard work of the PMO's, we have maintained about the same number of ships in the Voluntary Observing Ship (VOS) program. I was also very pleased to report that the number of weather reports received from ships at sea continued to increase over the last several years. In August 1983 an all time monthly high of 33,728 observations was achieved by the ships in our program. Most observers have improved both in quantity and quality. Well done!

HURRICANE SEASON COMING

The hurricane season commences June 1. The new hurricane letter is printed on page 86.

SPREP OR STORM REPORTS

The special report, SPREP and STORM weather prefixes are particularly important during the hurricane/typhoon season. These are discussed on pages 1-9 and 1-10 of the NWSOH No. 1. When the situation occurs where SPREP and STORM prefixes should be used, the appropriate prefix is entered before the ship's radio call in the weather report. For example:

STORM (Call) (Weather report)
SPREP (Call) (Weather report)

There is a blank on the 72-4A just for this purpose. At the National Meteorological Center (NMC) and at the forecast offices the list of ship weather reports comes in with a wide left margin. When either STORM or SPREP are used they print out in this margin. It makes the report very obvious and it gets immediate attention. SPREP means that conditions are worsening very rapidly, or the forecast for this position is incorrect. STORM means the average wind, whether forecast or not, is 48 kn (force 10) or greater.

WHAT ONE OBSERVATION CAN DO

The Maritime Institute of Technology and Graduate Studies (MITAGS) is an excellent sounding board for our program. During the last class the question of how much good one observation will do came up again. One observation can verify what is occurring at your position. Only when the forecaster has an observation from a position is he really sure what is happening there. It removes doubt. However, there is no way an observer can tell that his/her ship is the only ship in the area making weather reports. Each ship should contribute their weather report to add to the weather map whether they can see other ships or not. There are never enough ships in the right places to make a weather map equal to a land weather map with fixed stations so we rely heavily on each ship to do their best. As a consequence, each ship observation has to represent more area than a land station and this is why each ship observation is so very important.

Figure 26 from the Fall 1983 edition of the Mariners Weather Log (MWL) illustrates how one ship had a prefound effect on a forecast (fig.19). If that ship observation was not on that weather map, the storm, which was almost completely at sea, could not have been analyzed from the other data on that map. It was known that something was out there from previous maps, satellite images, etc. However, this single ship observation located the center of the storm and indicated that it had become much more severe than the previous forecast indicated.

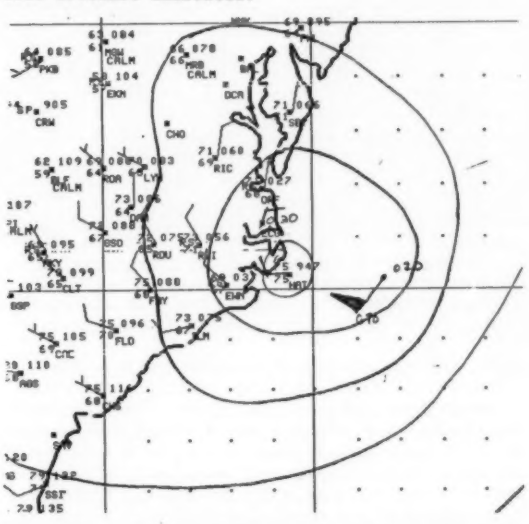


Figure 19.-- Excerpt from an East Coast weather map 13Z, June 19, 1982. The highest wind at a coast station is 10 kn, yet the ship 130 mi east of Hatteras has an average wind of 50 kn with gusts to 70 kn.

READING THE BAROMETER

In the last MWL, Winter 1984, page 16, "Misunderstandings and Mistakes in Observations," first bullet about barometer readings, part of the paragraph is missing. From a technical standpoint the barometer should (it is desirable) be read exactly on the synoptic hour. In that way the forecasters would have a description of the

weather frozen at that moment worldwide. This is, of course, impractical aboard ship and with the usual separation of ship reports, "exactly on the hour" barometer readings are not as important as the fixed, close-together land stations.

The part that was missing suggested that the observer adjust the time for reading the barometer within his observation routine so that it would be closest to being exactly on the hour. As an example: If the observation routine takes 20 minutes (may be more or less) and the observer starts at 1130Z he should read the barometer last, at 1150Z. If he starts at 1215Z, he should read it first. In other words, at the time closest to the synoptic hour which in this case is 12Z. Of course, if he starts at 1150Z, he should read the barometer at 1200Z - the ideal situation.

COORDINATION WITH THE RADIO OFFICER

Lacking the luxury of a 24-hour radio watch, the marine weather reporting system has to adjust to the watch hours of the radio officer. Most ships have one radio officer who stands an 8-12 local-time watch with 2 2-hour watch periods in the afternoon and evening. Most radio officers cooperate fully in the observing program; in fact, some make weather observations.

We need your weather reports and have set up a system to make it easier for you to get the report to us with the cooperation of the observers and the radio officer. On the back of the NOAA Form 72-4A, Weather Report for Immediate Radio Transmission, it mentions the urgency of getting the weather report transmitted. At the center of the page are two numbered paragraphs that explain two approved methods: the one-hour early and the intermediate synoptic report at 3 hours before, or after, synoptic time. The report should list the correct time of the observation. Then there are the STORM and SPREP messages where hourly transmissions are approved. You should be able to transmit at least one weather report for each radio officer's watch segment, and in certain bad weather situations, hourly. These are the options available to the ship's master.

RADIO WEATHER REPORTS (72-1A) AND OBSERVATIONS (72-1A)

At MITAGS, and in a few letters, we have heard the complaint that there are problems getting the weather report transmitted after the observation has been made. In one case, the radio officer did not have the book Radio Stations Accepting Ship's Weather and Oceanographic Observations. Looking at the "U.S. Voluntary Observing Ship Weather Reports" list in the Mariners Weather Log, it appears that there may be others having similar problems so I wrote a letter offering assistance. After the MOP/PMO conference it became apparent that the mailing had gone askew and the PMO's had not gotten copies of this letter among other things. The letter, figure 20, was supposed to have been sent to ships having a small number of radio reports in comparison with the mailed record observations (72-1A). Radio weather reports get on weather maps and are used to make weather forecasts. The benefits to the mariner are immediate in the form of forecasts and warnings. Mailed observation records are also very important as they are used in climatologies which are the starting base for various computer programs and are also used in ship and facility designs. As the letter says "if you have a reason, disregard the letter," however, if you need assistance, let us know.

Dear Captain:

I am writing to ships that show a large difference between the number of weather reports sent by radio and those received by mail, or a small number of radio weather reports. Your ship shows one of these problems. Sometimes the book with radio calls and frequencies of stations accepting weather observations has been lost. If this is the case, we will be happy to send a replacement. There are often good reasons which we are not aware of, in which case, please disregard this letter.

However, the importance of the radio weather report is sometimes not fully appreciated. If the weather report is transmitted promptly on the synoptic hour (00,06,12, or 18Z), so that it can get back to the Nationl Meteorological Center within the first hour, your ship's weather report will be used in all the computer models, and will appear on the forecaster's weather map. Each ship weather report has a definite effect on the weather forecast for the part of the ocean where it is located. There are a great many time when a single ship's report causes a major change in a weather map and a forecast. This is shown in the Fall 1983 Mariners Weather Log. It is certainly a safety factor on each voyage to be sure that the weather reports are transmitted in a timely manner and as frequently as possible.

All weather report messages are relayed without cost to the ship or its company. All that is necessary is to precede the message with the term "OBS." When transmitting to U.S. Coast Guard radio stations that is the only address needed. Worldwide addresses are contained in our book "Radio Stations Accepting Weather and Oceanographic Observations."

If you have any questions or need assistance, please write me or your servicing PMO. We greatly appreciate your past observations and hope you will continue your good work.

Sincerely yours,

Jerome W. Nickerson
Marine Observations
Program Leader

COASTAL WEATHER REPORTS

In a previous MWL, I said "make observations as close to the coast as you normally travel and traffic permit," even in San Francisco and Chesapeake Bay." Now it is "no" on San Francisco Bay and "yes" on Chesapeake Bay. Technically, we also can broaden that to exclude rivers and canals.

The point is - we really need coastal ship weather reports up to the sea buoy of most ports or rivers to make the kind of forecasts you say you want. The weather changes rapidly a few miles off the coast and land stations provide only

limited, and sometimes misleading, estimates of what is happening offshore.

If traffic prevents a full observation, a reduced observation would be most helpful. There are several stages to which the weather report may be reduced in special situations as discussed in NWSOH No. 1. The minimum is the ship's call sign and the first five groups, those that do not have a group indicator number. They are:

D.....D YYGGi$_w$ 99L$_a$L$_a$L$_a$ Q$_c$L$_o$L$_o$L$_o$
i$_R$i$_x$hVV Nddff

Any of the other groups with group indicator numbers may be added as the situation permits. As a forecaster, I would want pressure, weather, and sea and swell conditions (in that order) to analyze the weather map and make a forecast. In a situation that might have fog - air, dew point, and sea surface temperature are important. Remember, the group and section indicator 222 must be used before any group to the right of it can be used.

As you can see it is quite easy to make a case for a complete weather report. However, it is most important that you make at least the reduced weather report in the coastal waters. You should notice a definite improvement in the weather forecasts. Why - because it is over the coastal waters where the weather changes most rapidly. And, without your weather reports in the coastal waters the only information a forecaster has is the land stations. Look the land station reports in figure 19. Can anyone still question the importance of ship reports?

WATER SPOUTS

The observers on the AMERICAN RESOLUTE sent in two excellent photographs of a water spout (fig. 21) that they saw midway between Cape Hatteras and Bermuda (32-07N 68-39.7W). Weather conditions were: Pressure 1020.8 kPa (mb), wind 360° 4 knots, air temp. 14.4°C (58°F), water 18.3°C (65°F) and clouds are CL 3 and CH 7. It would be most helpful on future photo contributions to have a full observation sheet (72-1A) at the time of the photo. Excellent photos like these should be fully documented.

Figure 21.--Water spout abeam, note the spray where the wind vortex contacts the ocean.

The large difference between the air temperature and the water temperature indicates that the air is very unstable. Of course, the cumulonimbus clouds and the water spout confirm that the air aloft is also very unstable. Thanks for the excellent photos, RESOLUTE.

Water spouts come in all sizes from dust-devil size to that of a full fledged tornado. Ships should stay well clear.

ALASKA VOS

We don't have a PMO in Alaska, nor in Hawaii. However, Mr. Felix Flara from Alaska and Mr. Aki Kimura from Hawaii attended the MOP/PMO conference. We are planning on expanding PMO services in both areas in the future. Figure 22 shows the master and mates of the ARCTIC TOKYO with the special service award they received for weather reporting service between Alaska and Japan. Note the neat holder for the sling psychrometer on the bulkhead.

Figure 22.--Special Service Award, ARCTIC TOKYO. (L to R), 2nd Mate Formisano Ottavio, 3rd Mate Giusserre Chiavistelli, Master, Demencio Aiello holding the certificate.

MARINE UPPER AIR SOUNDING, ASAP

Many years ago many ships made upper air sounding either with their own crews or with ESSA or U.S. Navy teams. These augmented the soundings made from light ships and weather station ships. These have all been gone for many years, but now a new joint U.S. and Canadian marine upper air sounding system is being tested. It is called the Automated Shipboard Aerological Program, ASAP for short.

The ASAP system is housed in a 20-foot (6.1m) container. It has to be attached to the top of a container profile or the deck aft, as the operator enters through a side door and the top has a trap door for the balloon release, as shown in figure 23.

The radiosonde balloon is inflated inside the container and the radiosonde is attached. When everything is ready, the doors in the top of the container roll back, a barrel-shaped balloon launcher rises out of the container pointed downwind. When released, the balloon floats out of the launcher carrying the radiosonde.

Figure 23.--Balloon and radiosonde leaving ASAP ballon launcher.

The ASAP has one radiosonde container in the Pacific, at present, operated by Canada aboard the Japanese car-carrier FRIENDSHIP. This summer, this ASAP container will be transferred to the Atlantic and a newer version will be installed on the FRIENDSHIP. The purpose of the ASAP is to calibrate satellite sounders over the oceans.

MARINE WEATHER BONUS BOOKS

To show our appreciation for the ship observations and provide observers with useful information on marine weather. MOP purchased two books for the ships:
Marine Weather by Bowditch and Weather and Climate of the Great Lakes Region by Eichenlaub.

These books have been turned over to the PMO's for distribution to ships in the Volunteer Observing Ship program (fig. 24). If you don't already have one, write or contact your servicing PMO.

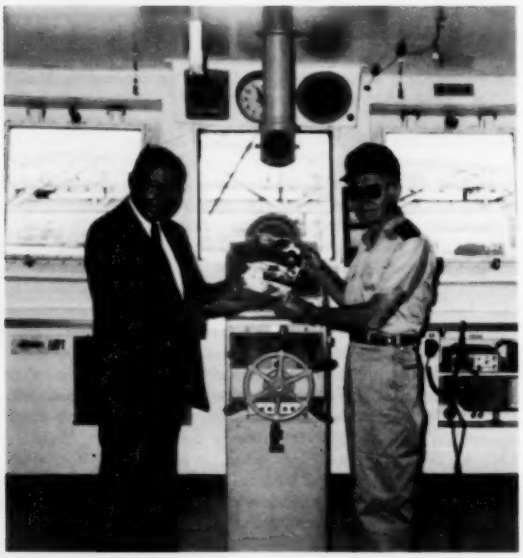


Figure 24.-- PMO James Mullick (left) presenting a copy of Marine Weather to Capt. D. Dowling of Matson Lines MAUI.

IMPORTANCE OF TROPICAL CYCLONE WEATHER REPORTS

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL WEATHER SERVICE
Silver Spring, Md. 20910

W/OTS21X2:JWN

Dear Captain:

This letter is important to the safety of your ship. Please be sure your watch and radio officers also read it.

The hurricane season commences June 1 and runs through November 30. At the National Weather Service Offices and the National Hurricane Center, special programs are set into motion to improve your safety. You can assist us as follows:

1. When within 300 miles of tropical storms or hurricanes, transmit weather observations at least every 3 hours. Hourly reports when within the storm would be very beneficial, if routine permits.

2. In the "Remarks" section of the Ship's Weather Observations, NOAA Form 72-1A (also called the log or record), and in the weather message transmitted by radio, include the lowest pressure and/or the highest wind encountered since the last synoptic (00, 06, 12, or 18 GMT) report, if:

   a. The pressure was more than 5 millibars lower and/or,

   b. The wind was more than 15 knots higher than the last report. Include the time of occurrence in the radio message and on the record.

3. Use the prefix "STORM" on the weather message when the wind is 48 knots or more. If you are in a named tropical storm or hurricane use the name in the remarks.

4. Example of radio message:

   STORM (Standard weather report) JOHN 1305Z LOWEST PRES 955MB 1240Z HIGHEST WIND 80 KTS GUSTS TO 100 KTS.

The position on each weather report automatically updates your ANVER position making it infinitely easier to find your ship and give assistance, if required.

The weather observations from your ship and the other ships in the worldwide volunteer observing ship program provide the basis for weather, tropical storm, and hurricane forecasts over the oceans. Thank you for your past efforts and please continue them into the future. I wish you a safe hurricane season.

Sincerely,

George M. Nickerson
Marine Observations
Program Leader

GENERAL INSTRUCTIONS

ANVER MESSAGES

ANVER messages can tie up radio stations during the regular weather reporting hours of 00, 06, 12, and 18 GMT. Try to avoid sending ANVER messages from one-half hour before to 2 hours after these hours. Your weather report updates your ship's position and is a "class B" ANVER position report.

SITOR or CW Weather Reports Through the U.S. Coast Guard

U.S. Coast Guard radio stations are the first choice for weather message relay, and we request that properly equipped ships attempt contact on two different frequencies before shifting to commercial stations. It is sufficient to identify the weather message as "OBS" and then proceed with the message commencing with the radio call sign, or STORM, if appropriate. The message preamble and "OBS METEO WASH DC," which are not passed, are considered unnecessary and delay the report at U.S. Coast Guard stations only.

Example: "STORM CALL YYGGiw 99LaLaLa, etc . . ."

INMARSAT (MARISAT, COMSAT) Weather Reports

Ships equipped with INMARSAT communications systems as a primary means of communication may transmit weather reports via the U.S. Coastal Earth Stations. They should use the Telex No. 00 230 89406. This number is also the address, so "OBS METEO WASH DC" should not be used. NWS will accept charges to this number for weather reports if you are in the U.S. high-seas weather forecast areas (see below). No ship or company is ever charged for sending a weather report using the specified procedures.

SITOR or CW Weather Reports Through Specified U.S. Commercial Radio Stations

In the event that a ship cannot contact the U.S. Coast Guard and does not have INMARSAT, a third priority choice is available through U.S. commercial radio stations specified in the publication "Radio Stations Accepting Ships' Weather and Oceanographic Observations." The ships must be in the U.S. forecast areas and the message must be transmitted within 3 hours following the synoptic hour. Starting after the radio call sign, commercial radio weather reports will be sent in 10- character groups. Only the current weather report should be transmitted.

U.S. High-Seas Forecast and Warning Areas

In the Pacific, from 160°E eastward to the coast and from 25°S northward. In the Atlantic, from 35°W westward to the coast and from 3°N northward. INMARSAT weather reports will also be a accepted from 60°S southward.

GUAM

Western North Pacific between 5°N. and 25°N. latitude and from 135°E. longitude to the 180th Meridian (WMO GUAM ZONE).

Single Sideband (Radiotelephone) Voice Weather Reports

Weather reports may be made using single sideband (SSB) radios and reporting to selected U.S. Coast Guard radio stations. Use the same format as the CW reports by speaking the numbers. Your SSB report will then enter the weather reporting system just the same as the standard high-seas weather report.

Tips to the Radio Officer

COAST GUARD COMMUNICATIONS PROBLEMS

When the Radio Officer has problems or complaints concerning communication of weather messages through the U.S. Coast Guard be sure to log them in detail on the back side of the Ships Weather Observations Form 72-1A. The National Weather Service, Marine Observations Program Office, has developed excellent contacts with the Coast Guard and they are working hard to correct problems. They need the information on any problems as quickly as possible to facilitate their solution.

The Marine Observations Program has set up a system for direct contact with the proper people at Coast Guard Headquarters. They desire to correct communication problems as quickly as possible and results are being seen.

If the Radio Officer can not contact the Coast Guard station a minimum of five items are needed: Time/Date/Position/Frequency/Station called. Any other details that would help in investigating the problem.

TEN CHARACTER GROUP WEATHER MESSAGES

The U.S. Coast Guard stations will accept ten character group weather messages. The five character weather groups can all be combined into ten character groups. Only STORM, SPREP, and Call Sign can not be combined with each other or the weather message. An example: STORM DSPY 22113 99410 70261 41998... etc. can be sent STORM DSPY 2211399410 702614998... etc. All weather messages may be sent in ten character groups through any communications facility, i.e., Coast Guard, INMARSAT, and Commercial.

NAVY WEATHER FACSIMILE SCHEDULE

The Navy weather facsimile schedule from the Naval Eastern Oceanography Center, Norfolk, VA is now transmitted only on Saturdays at 0115Z.

The Editor's Desk

The Year of the Ocean

A Year of Opportunity

The ocean reaches directly or indirectly, into the life of every human on earth. We depend on it for food, for transportation, for petroleum, for recreation, for military security, for waste disposal and, probably soon, for minerals. The ocean is the nursery of our weather, from fair skies to killer storms. It has a larger place in our lives than most of us know.

As we look more and more to the ocean for its bounty and for scores of other uses, the pressure on this vast, but finite and fragile, resource, grows, almost invisibly but nevertheless rapidly. Preserving its productivity and health, at the same time, is a major national concern.

YEAR OF THE OCEAN ESTABLISHED

This concern has led to the creation of the Year of the Ocean, a nationwide observance which officially began on March 10, 1984, the first anniversary of President Reagan's proclamation of the 200 mi immediately off our shores as an Exclusive Economic Zone.

The Year is designed to expand public understanding of the ocean's potential and problems, to promote ocean stewardship, and to help build a public-private partnership for the wise management of ocean resources.

Its activities will be coordinated by a Year of the Ocean Foundation, a non-partisan, non-profit corporation which will work toward the broadest possible national participation.

Efforts will be concentrated in three major areas: awareness, celebration and stewardship. Under these banners, the Foundation will work to acquaint the nation with the ocean's benefits and the demands upon it; to stimulate constructive community celebration; and, perhaps most importantly, to strengthen the dialogue among those who use the sea, to foster both its productivity and its health.

WHAT IT MEANS TO YOU

Almost everybody can contribute to this exciting project, and benefit from it, too.

During the Year, the Foundation will issue many kinds of ocean information -- information valuable to everybody from the student to the environmentalist. The better our understanding of the ocean and its fascinating processes and effects, the better-equipped we are to live with this great resource.

There will be celebrations across the nation, celebrations which will be as valuable as they are enjoyable, in which all can join. The Foundation will encourage constructive activities as well as events planned simply for pleasure -- activities which will have a lasting benefit for the community and for the ocean it honors.

And, perhaps most importantly, the Year will focus on stewardship, the wise management and conservation of the ocean. The list of ocean problems is long and well known; solutions do not come so easily. Nationally and locally, we need communication and action among the many interests involved with the sea.

There's a place for you in all of the Year's activities. Please become a part of this exciting effort.

For more information, write ....

Year of the Ocean Foundation
Box 1100
3421 M Street, N.W.
Washington, D.C. 20007
(202) 333-1188

THE WHITE HOUSE

Washington
March 8, 1984

I want to take this opportunity to recognize 1984 as the Year of the Ocean. This special designation will heighten our awareness of the essential role of the sea in the life and future of our nation.

From its earliest days America has been a seafaring nation and a naval power, depending on the ocean for food, transportation, and recreation. The ocean is a significant element in our national security.

As our country has grown, its ties to the sea have assumed greater importance. In this era of expanded need for resources, the oceans will play an even more critical part in helping mankind build a better world. To underscore this fact, I proclaimed in 1983 a United States Exclusive Economic Zone over all resources out to the 200-mile limt.

This great saltwater resource reaches, directly or indirectly, into every American life. Among other things, it provides fish for our tables, petroleum for heat and fuel, and waterways for transportation. It serves as our pathway to the rest of the world and as the medium for the majority of our foreign trade.

As we rely increasingly on the ocean's bounty, the demands for its resources will grow. The Year of the Ocean will provide an excellent opportunity to examine our ocean heritage and our ocean future as we approach the twenty-first century.

Ronald Reagan

HURRICANE-LIKE STORMS POSE THREAT IN ARCTIC

Research by the National Oceanic and Atmospheric Administration has documented for the first time the existence of arctic cyclones, fast-moving storms with hurricane-force winds and 50-ft waves.

The 6-week airborne study over the Norwegian Sea established that the rotating motion of the storms can create circular surface winds strong enough to threaten oil rigs and capsize small vessels, and cause dangerous superstructure icing on ships. Extensive data on storm structure and behavior, and sea state conditions, were gained on flights aboard a NOAA research plane from Iceland and Norway, at altitudes ranging from 1,000 to 25,000 feet.

The information collected over the Norwegian Sea last January and February is pertinent to the Bering Sea and North Pacific Ocean off Alaska and the northwest United States. The study is expected to lead to better understanding and forecasting of storm development and movement from the Arctic Circle to populated areas.

ST. LAWRENCE SEAWAY 25TH ANNIVERSARY

This year the St. Lawrence Seaway will celebrate its 25th anniversary and a new bi-national symbol has been prepared to mark the event (fig. 25). The international partnership involved in both the construction of the Seaway and today's combined U.S.-Canadian operation of the waterway is represented in the symbol which combines an American star with a Canadian maple leaf. The water which flows through the Seaway locks, lifting ships from the Atlantic Ocean to Lake Superior, is represented in the symbol by the number 25. Distinctive fresh-water and ocean-going vessels reflect the importance of Seaway shipping.

Figure 25.-- 25th Anniversary Logo.

Seaway Review, which has been licensed by the Ontario government to regulate the use of the logo in the United States, is working with both the St. Lawrence Seaway Development Corporation and the Great Lakes Commission in establishing the Anniversary year. A federal proclamation is in the works which would identify 1984 as the "Year of the Seaway." In addition, a lake-by-lake calendar of events is being developed which will reflect the extent of the celebration on both sides of the border. Both the American and Canadian postal authorities have agreed to produce a postage stamp commemorating the 25th Anniversary event. Reprinted from Lake Log Chips.

NWS EAST COAST MARINE INFORMATION SERVICE

National Weather Service, the Univ. of Maryland and the Ocean Service Unit at the Washington, DC forecast office has established an East Coast Marine Information Service. The service, available to the users of marine weather forecasts and other related marine information, disseminates marine forecasts over standard telephone lines to computer terminals that can be located in any marina, marine supply store, or at home.

The forecasts are prepared by NWS Forecast Offices, and relayed over the Automated Forecast & Observation System (AFOS) every 6 hr. The Washington Forecast Office makes a collection of all the appropriate forecasts, reformats the forecasts, and then sends the collection to be stored in the University's host computer at Easton, MD. The user of the service simply calls the host computer telephone number via his computer to extract the required information -- all for the price of the telephone call. The service is equipped to handle eight calls simultaneously. For further information, contact: Ocean Services Unit, NWS Forecast Office, World Weather Bldg., Rm. 302, Washington, DC 20233; (301) 763-8088.

STUDIES FOCUS ON OCEAN ROLE IN CLIMATE, ACID RAIN, CO_2

The National Oceanic and Atmospheric Administration (NOAA) will conduct a series of interlocking oceanic and atmospheric experiments from mid-May until early June between Hawaii and Tahiti to learn how the Pacific affects our climate and environment.

NOAA's ship Researcher and its P-3 aircraft, two of the most sophisticated air-sea research platforms in operation, will be studying the effect of the equatorial ocean on climatic disasters, acid rain and the carbon dioxide balance.

The Researcher will take water and air measurements between Honolulu and Tahiti from May 14 to June 4. The NOAA aircraft will fly over the ship from airfields in Honolulu, Christmas Island and Tahiti, taking complementary measurements, and collecting air samples.

Two studies involve the exchange, or flux, of chemicals from the ocean to the atmosphere. One may shed light on why rain in remote marine areas often is as acid-laden as that in some coastal areas. The other will investigate air-sea transfer characteristics for carbon dioxide.

In two other studies, scientists will sample the marine boundary layer -- the lower several hundred feet of the atmosphere. One seeks to reveal the role of updrafts and downdrafts -- turbulence -- in the exchange of heat between the ocean and the atmosphere; the second hopes to learn how boundary layer processes affect the movement of air -- the trade winds -- approaching the equatorial zone.

COAST GUARD TO ACTIVATE VESSEL TRAFFIC SERVICE IN NEW YORK

Secretary of Transportation Elizabeth Hanford Dole has announced the U.S. Coast Guard plans to activate a traffic control monitoring system for the congested area of the New York City harbor between Manhattan and Staten Island.

This decision will enhance the safety of one of the largest marine transportation hubs in the United States and is in keeping with our goals of always striving to improve transportation safety.

The traffic control and coordinating system will use radar, radio and low-light television cameras mounted on high buildings or other fixed points overlooking the harbor to monitor ship movement.

The Coast Guard plans to put the Vessel Traffic Service into operation during the winter of 1984-1985. It will be located on Governors Island and staffed around the clock. The focus of the area to be served includes the principal commuter ferry routes. When operational, the system has the flexibility to cover a larger area during any emergency.

1983-84 WINTER SIXTH COLDEST SINCE 1931

Despite a warmer than normal February, the winter of 1983-84 (December-February) proved to be the sixth coldest on record for the country as a whole since reliable record keeping began in 1931, according to NOAA.

The season was remarkable for its extreme ranges in temperatures: from record-breaking cold over much of the country in December to unusual warm spells in January and February.

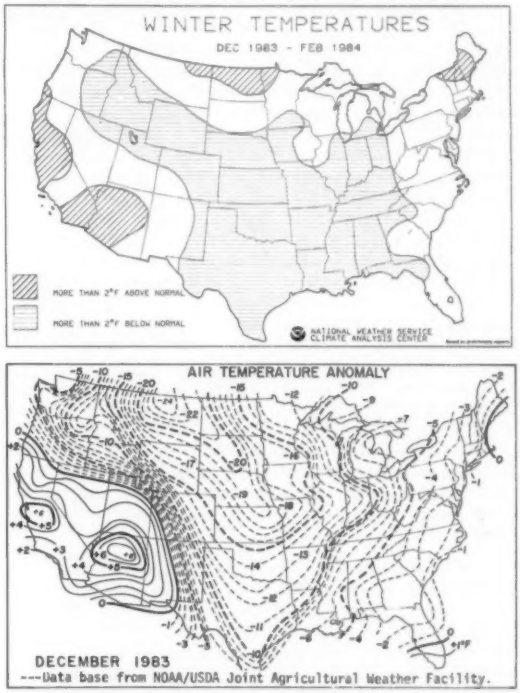

WINTER TEMPERATURES
DEC 1983 - FEB 1984
MORE THAN 2°F ABOVE NORMAL
MORE THAN 2°F BELOW NORMAL
NATIONAL WEATHER SERVICE
CLIMATE ANALYSIS CENTER
AIR TEMPERATURE ANOMALY
DECEMBER 1983
---Data base from NOAA/USDA Joint Agricultural Weather Facility.

Figure 26.-- Temperature departure from normal for Dec. 83 - Feb. 84, and for December, 1983.

Winter in Williston, N.D., proved to be a microcosm of the nation's winter weather. That city recorded 50 degrees below zero Fahrenheit on December 23, tying the all-time minimum, but 2 weeks later daily maximum temperature records were broken there with readings in the upper 40s.

For the country as a whole, December was the

coldest in at least 53 years. The late December cold wave was one of the most severe on record and set hundreds of individual temperature records from the Pacific Northwest of Florida.

January featured unusual warmth in the northern Plains early in the month, followed by another severe cold outbreak that swept to the East Coast.

February turned out to be a month of mild temperatures across most of the country. Worcester, Mass., and Youngstown, Ohio, experienced their warmest February ever, each averaging more than 9°F above normal for the month.

Below normal temperatures predominated this winter in the northern Rockies and over the Great Plains and Mississippi Valley from Nebraska, Illinois and Ohio, southward to the Gulf Coast (fig. 26).

Winter temperatures averaged as much at 8°F below normal in Idaho and Wyoming and 6°F below normal in Louisiana.

Parts of California and Arizona, on the other hand, experienced temperatures averaging up to 4°F above normal for the winter. Temperatures also averaged more than 2°F above normal in the extreme northern Plains and in parts of northern New England. The rest of the country experienced near normal temperatures during the winter months.

Storms in the northern and central Rockies dumped up to twice the normal amounts of snow in some areas, posing the threat of spring floods in Utah, western Colorado, Nevada, Idaho, and eastern Oregon. The far Southwest, especially southern California, however, was unusually dry. Los Angeles, for example, received only one third of its normal precipitation during the winter months, usually that area's wettest period of the year.

Although the winter temperatures averaged to be the sixth coldest nationally, the nation's heating bill was near normal for the winter because of the manner in which the temperature variations were distributed with respect to population centers.

National residential heating costs fluctuated wildly on a monthly basis, but ended up near normal (given current energy prices), for the winter season. The national bill in December of $1.6 billion above normal was balanced by a bill $1.6 billion below normal in February. January's bill of $0.7 billion above normal resulted in a total national heating bill for the three winter months of 2 percent above normal. Total national heating expenditures for the three months are estimated at $30.7 billion.

HURRICANE FLOODING MODELS COMPLETED FOR FOUR ATLANTIC/GULF COAST SITES

Four Atlantic and Gulf Coast areas with populations totalling millions have been added to those that can get computer-assisted early warnings of hurricane flooding, through computer models, NOAA has announced.

The Commerce Department agency said storm surge models covering Buzzards Bay and Narragansett Bay, in Massachusetts and Rhode Island; Delaware Bay, in Delaware and New Jersey; Matagorda Bay and Lower Laguna Bay, on the central and south Texas coast, have been completed in advance of the 1984 hurricane season. The additions bring to 18 the number of locations covered, reaching most of the Atlantic and Gulf shoreline.

Those for New York's Long Island Sound and for the Boston-Cape Cod area are scheduled for completion by July. Others are under development for Hilton Head, S.C., and Brunswick, Ga.

The models take into account storm size and speed as well as coastal topography, all factors which contribute to the extent of coastal flooding from hurricanes. Such flooding is caused by the hurricane's storm surge, a dome of water about 50 mi wide that sweeps ashore ahead of the winds. Storm surge is the primary cause of coastal flooding, and is responsible for nine out of ten hurricane fatalities.

In addition to their value in hurricane forecasting, the storm surge models are available to community officials for use in developing comprehensive evacuation plans. Such plans are based on a series of computer runs with the models, utilizing hypothetical hurricanes of varying tracks and intensities.

MARAD BUYS U.S. PASSENGER/CARGO VESSEL FOR CONVERSION TO TRAINING SHIP

The Maritime Administration (MARAD) has announced the purchase of the SS SANTA MERCEDES and it will be loaned to the Massachusetts Maritime Academy for use as a schoolship.

The passenger-cargo-container vessel was obtained from Vessel Charters, Inc., a subsidiary of Prudential Lines, Inc., for $4.2 million.

The ship, now docked in San Francisco, will be converted and delivered to the Academy in 1985. It will replace the training ship BAY STATE, which was heavily damaged by fire while moored at the Buzzards Bay, Mass., school's pier on Dec. 22, 1981.

"After an extensive worldwide search," Adm. Shear said, "we have found an excellent ship to replace the BAY STATE and the conversion of the MERCEDES for schoolship purposes will provide work for a U.S. shipyard."

The vessel, which has an overall length of 547 ft, currently has accomodations for 119 passengers. The conversion work will include installation of quarters for up to 600 cadets, plus classrooms and related facilities.

MARAD, in its education and training program, operates the U.S. Merchant Marine Academy at Kings Point, N.Y. and also assists in the training of merchant marine officers at state academies in California, Maine, Massachusetts, Michigan, New York and Texas, Training ships are provided to the five "saltwater" academies (other than Michigan).

NOAA DEVELOPING PROCESS TO FORECAST SHIP ICING

NOAA scientists are working to reduce the perils of super-structure icing in northern waters. New techniques, in the form of mathematical models, are being developed to help marine weather forecasters determine areas where potentially deadly icing on ships and oil rigs is most likely to occur.

The models are being devised under the supervision of the Commerce Department agency's Pacific Marine Environmental Laboratory in Seattle. The rate at which ice accumulates on marine structures, sometimes causing vessels to capsize, depends upon several ocean and atmospheric factors. These

include wind speed, air temperature, dew point depression, sea surface temperature, wave height, and wet-bulb temperature on the surface of a ship or platform.

Several years ago, under a NOAA contract, the Arctic Environmental Information and Data Center in Anchorage developed nomograms -- tables with which fishermen and others could make rough estimates of the icing accumulation rate if they knew the air and ocean temperature and the wind speed.

Almost 1,000 copies of the nomograms have been distributed to Northeastern Pacific fishermen, off-shore oil platform foremen, and others. Similar tables are available to Northwestern Atlantic mariners. Now the center is working on the mathematical models.

COASTAL-MARINE AUTOMATED NETWORK (C-MAN UPDATE)

On November 15, 1982, the first C-MAN prototype station was installed at Cape San Blas, Florida. This solar-powered station has all equipment mounted on a free-standing, 30-foot skeleton tower. In addition to hourly reports via GOES, data acquired every 15 minutes are available upon request via telephone. The station has functioned failure-free since its installation.

The second prototype station was installed March 3, 1983, on the U.S. Coast Guard lighthouse at Dunkirk, NY. It was retrofitted July 28, 1983, with the first production Data Acquisition Control and Telemetry (DACT). This station is powered by commercial ac power and is accessible by telephone.

The prototype buoy DACT was deployed April 21, 1983, on the St. George Reef, CA, LNB at station 46027. The LNB is powered by a 2-year supply of primary batteries. Data are only available via hourly self-timed reports to GOES. This LNB was retrofitted with a production DACT on August 25, 1983.

Phase two of the program, implementation of operational stations, began in September 1983 with the installation of the station at South Bass Island, OH. Since the, stations have been installed at Galloo Island, NY; Devils Island, MI; Rock of Ages, MI; and Sheboygan, WI. The Delaware Bay LNB (44009), outfitted with a production DACT system, was deployed on January 4, 1984. DACTs will be installed at the remaining C-MAN sites and six existing automated stations over the next 18 months.

From NOAA Data Buoy Center Technical Bulletin by R. H. Canada.

1984 TROPICAL CYCLONE NAMES

The first tropical cyclone of the 1984 hurricane season in the Atlantic Ocean, Caribbean, or Gulf of Mexico will be dubbed Arthur, according to NOAA. The season officially opens June 1 and runs through Nov. 30.

Following Arthur will be Bertha, Cesar, Diana, Edouard, Fran, Gustav, Hortense, Isidore, Josephine, Klaus, Lili, Marco, Nana, Omar, Paloma, Rene, Sally, Teddy, Vicky and Wilfred.

The first tropical cyclone occurring in the eastern North Pacific will be called Alma. It will be succeeded by Boris, Cristina, Douglas, Elida, Fausto, Genevieve, Hernan, Iselle, Julio, Kenna, Lowell, Marie, Norbert, Odile, Polo, Rachel, Simon, Trudy, Vance and Wallis.

Storms occurring in the central Pacific Ocean will be named: Akoni, Ema, Hana, Io, Keli, Lala, Moke, Nele, Oka, Peke, Uleki and Wila.

Names are given to tropical disturbances when they intensify into tropical storms with rotating circulations and wind speeds ranging from 39 to 73 mi per hr. Storms with winds exceeding 73 mi per hr are classified as hurricanes.

NOAA's National Weather Service maintains a constant watch over hurricane breeding areas for tropical disturbances that may form into hurricanes. Its National Hurricane Center in Miami monitors the Atlantic, Caribbean and Gulf of Mexico waters. The central and eastern North Pacific Ocean is watched by Weather Service centers in Honolulu and San Francisco.

MARINE WEATHER REVIEW

The Weather Logs combined with the cyclone tracks, U.S. Ocean Buoy climatological data, gale and wave tables, and mean pressure patterns are a definitive report on the weather systems and primary storms which affected the North Atlantic and North Pacific Oceans during this 3-mo period. Hurricane Alley lists and describes tropical cyclones worldwide. Unless stated otherwise, all winds are sustained winds and not gusts; all times are G.M.T.

North Atlantic Weather Log
October, November and December 1983

WEATHER LOG, OCTOBER 1983--A quick estimate indicates there were more than the usual number of cyclones across the North Atlantic this month. The favorite path was also more concentrated between Hamilton Inlet and the Faeroe Islands than climatology indicates. Three secondary tracks feed into an area south of Kap Farvel to become a primary track eastnortheastward to near Nordkapp. A secondary track broke off eastward near the Faeroe Islands to southern Norway. The more intense storms were concentrated in the last week of the month.

There were two centers to the Icelandic Low (fig. 27). One was 998 mb on the south coast of Iceland and the other 995 mb over Nordkapp. This configuration produced roughly westerly zonal flow between latitudes 50° and 60°N from about longitude 30°W into southern Scandinavia. The Azores High was 1025 mb near 39°N, 30°W, about 300 mi north of its normal location. There was also a 1022 mb High near New York City. Europe south of latitude 50°N was under higher than normal pressure.

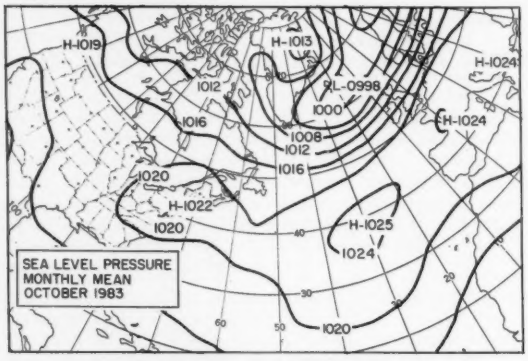


Figure 27.-- Mean sea-level pressure.

The major anomaly was minus 13 mb centered near the White Sea. The zero isoline stretched from the Caspian Sea across Scotland to east of Kap Farvel, then north through the Denmark Strait. The areas to the south and west were positive. There were four significant positive anomaly centers: a plus 5 mb over Maine, a 7 mb west of Cape Finisterre, a 7 mb over southwest France, and a 6 mb over Algeria.

The primary circulation center at 700 mb was nearly directly over the North Pole.[2] There was an anomalous HIGH over Scoresby Sound. A trough stretched southward to Scandinavia. The flow between 40° and 60°N was zonal and more intense than normal.

Some Climatology. A great storm struck New England on the 4th in 1869 with heavy rains of over 12 in, strong winds, and high tides. The journal of John Winthrop reports a mighty tempest on the 5th in 1638. This was the second strong hurricane in 3 yr and blew down trees in mile long tracks. On the 7th in 1970 a slow moving tropical depression caused widespread flooding in Puerto Rico during 6 days of rain. Up to 17 in fell this day at some locations with totals up to 38 in.[3]

Prolonged drought and dessicating winds led to the Great Chicago Fire on the 8th in 1871. A fire holocaust hit Michigan with 2.5 million acres burned and 200 people killed, and another consumed Peshtigo, Wis. killing more than 1,100 persons.

The great hurricane of 1846 tracked up the East Coast; its track was similar to Hazel 108 yr later. On the 17th in 1950 a small - powerful hurricane struck Miami. On the 19th in 1906 a hurricane struck south Florida drowning 124 persons stranded in the Keys.

The infamous Great Lakes storm occurred on the 19th, 1844. Southwest hurricane force winds drove Lake Erie waters into Buffalo, and 200 persons drowned in the storm. On the 20th in 1770 a heavy storm struck eastern New England. A 1921 hurricane hit Tampa, Fla. on the 25th with 100 mi/hr winds. On the 26th, 1859 New York City had their earliest snow fall of record with 4 in.

Extratropical Cyclones--The month started out with a large LOW about 750 mi south of Iceland. It was described in the September Weather Log. A HIGH drifted southeastward from Nova Scotia as the LOW moved northeastward. At the end of the week the HIGH was in place as the Azores High. The LOWs were traveling the Gulf of St. Lawrence to Denmark Strait route.

The second week the Azores High was reinforced from the west along 45°N latitude and drifted eastward. Another large HIGH moved over Nova Scotia. A LOW emerged from between the two HIGHs. By the end of the week the eastern HIGH was over the Balkans.

The third week a LOW from over the Labrador

Sea became severe south of Iceland, and the Azores High was normal. By midweek the Azores High was moving eastward and another HIGH moved eastward from Newfoundland. By the end of the week this HIGH was west of Ireland with many weak pressure centers scattered over the ocean.

At the beginning of the fourth week there was a 1040 mb HIGH over England and a 1038 mb HIGH centered over Maine. By midweek a severe LOW had moved over Nordkapp. The high pressure over England moved eastward and yet another HIGH moved into Europe. At end of the week a cut-off LOW was west of Lisbon. An elongated north-south HIGH moved to the central ocean. The end of the month found a severe LOW centered near Iceland. There was a high pressure belt across the ocean centered on the New York City to Bordeaux latitude.

This severe storm originated near 38°N, 59°W on the 9th in an easterly wave. On the 11th the CENTAURE (45°N, 40°W) near the apex of the warm sector had 40-kn winds and 20-ft waves. West of the center ships and rigs were reporting gales and waves up to 20 ft. At 1200 on the 12th the storm was 964 mb near 59°N, 19°W. The LUDWIGSHAFEN EXPRESS (46°N, 22°W) measured 52-kn west winds and 13-ft waves. ROMEO and LIMA had gales with 25-ft waves. The PFIH (59°N, 33°W) had 47-kn northwesterly winds, 17-ft seas, and 30-ft swells. On the 13th a Soviet ship near 45°N, 08°W had 33-ft swells. Two British ships, the RUBENS (47°N, 42°W) and the GCML (59°N, 06°W) had winds near 50 kn, 20-ft seas, and 25-ft swells (fig. 28). The pontoon JASMINES TURTLE broke away from the tug LADY VERA on the 13th off the coast of Skye.

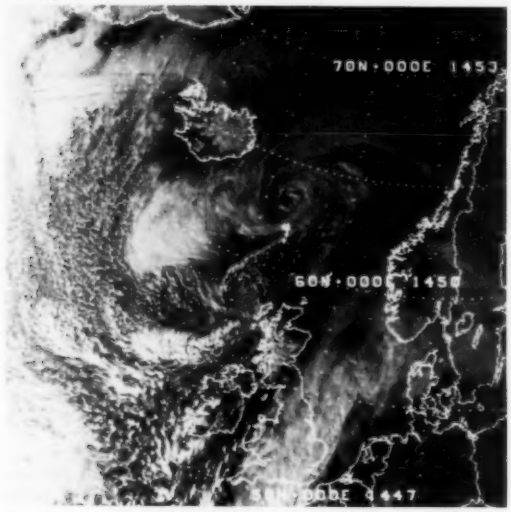


Figure 28.-- Satellite shows the storm near 63°N, 08°W. NOAA.

On the 14th the storm was 960 mb moving northeastward east of Iceland. A frontal wave from the Labrador Sea moved into the southwestern part of the circulation. There were many gale and storm wind reports with waves near 20 ft over the North Sea and Norwegian Sea. The LOW moved over the Barents Sea on the 17th.

Monster of the Month--This frontal wave was first analyzed over the Labrador Sea on the 13th. By 1200 on the 14th it was 972 mb near 60°N, 30°W. CHARLIE had 45-kn winds with 25-ft seas. The MINERAL SAMITRI (49°N, 31°W) measured 48-kn winds with 23-ft seas and 33-ft swells. The NORDLAND V (47°N, 43°W) measured 58-kn westerly winds with 38-ft seas. At 1200 on the 15th the 958-mb LOW was at 57°N, 13°W (fig. 29). There were many wind reports over 50 kn. The LEPTON (55°N, 23°W) measured 70 kn winds. The FEDERAL HURON (52°N, 17°W) and the FEDERAL HUDSON (52°N, 19°W) were both sailing west at 1 to 5 kn measuring 60-kn winds with the HURON reporting 33-ft swells. The VRNZ (51°N, 20°W) also measured 60 kn winds with 39-ft swells while the Alex JOHNSON (48°N, 13°W) measured 52 kn with 39-ft seas. On the 16th the storm had turned northeastward. The FEDERAL HURON still had 39-ft swells. Most of the winds were gale to strong gale strength with waves up to 26 ft.

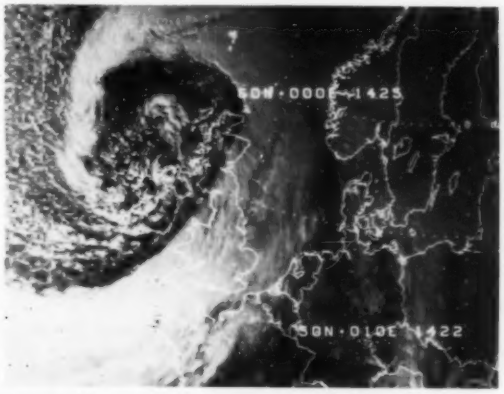


Figure 29.-- Most of the high winds and waves were in the southwest quadrant under cumulus clouds. NOAA.

These vessels had cargo shift during this storm; the CARYATIS in the English Channel, the KOLASIN near 48°N, 08°W, and the MINGARY in the Bay of Biscay. The BALDERO lost three containers overboard near 47°N, 07°W. Winds blowing up to 60 kn off the Brittany coast swept small boats to sea.

Another northern storm. On the 20th a LOW from the west and a frontal wave from the southwest moved into the vicinity of Kap Farvel. From these low-pressure areas and their instability a LOW was analyzed southeast of Angmagssalik on the 21st. At 1200 on the 23d the storm was 960 mb near 69°N, 06°E. MIKE measured 54-kn westerly winds with 26-ft seas. Many platforms were reporting up to strong gales and 20-ft seas while others had up to 30 ft seas. In the vicinity of 65°N, 10°E several ships and platforms had winds near 60 kn and one had 39-ft seas. On the 24th, MIKE still had 44-kn winds and 20-ft waves. The

storm was now well over the Barents Sea.

The SELBYDYKE (63°N, 01°E) had the deck cargo of timber shift in force 10 to 11 winds. She took refuge at Thorshavn, Faeroes. The ATLANTIC VEST accompanied her into port. The SUNNFJORD II developed a heavy list south of Stavanger while in tow of the tug VOLCANUS.

This LOW formed off Long Island late on the 24th. It quickly intensified over the Gulf Stream and was 988 mb near 43°N, 60°W, at 1200 on the 25th, a small tight storm. The C.P. TRADER (42°N, 57°W) measured 45-kn winds with 10-ft seas, and 30-ft swells. The RIGG at 44°N, 59°W measured 70-kn northeasterly winds with 26-ft seas. Two ships near 44°N, 59°W, the KOLN EXPRESS and TFL ENTERPRISE both measured 64-kn north and easterly winds with 30- and 23-ft waves respectively. There were still some winds over 50 kn on the 26th. SEDCO 706 reported 51-kn winds and 17-ft seas on the 27th. On the 28th the storm was moving northward into the Davis Strait to disintegrate.

As the storm above broke up on the southwest coast of Greenland this storm burst forth off the southeast coast on the 29th. At 1200 it was 968 mb. CHARLIE measured 41-kn winds with 21-ft seas while LIMA measured 45-kn winds and 20-ft seas. The storm was 952 mb near 65°N, 03°W at 1200 on the 30th. The Faeroe Islands registered 50-kn winds. The CHELSEA (54°N, 18°W) found 52-kn winds with 15-ft seas. Several Icelandic fishing vessels had winds over 50 kn. The BORISPOL (59°N, 07°W) measured 48-kn westerly winds with 30-ft seas. The many reporting stations in the North Sea were having 40-to 60-kn winds and waves up to 25 ft. Early on the 31st, the winds were up to 50 kn but later in the day the storm fell apart.

The DUSSELDORF EXPRESS lost containers overboard off Cape Wrath. The FJORDING foundered on the coast south of Stavanger. The JAROSLAW had to put into Emden due to cargo shifting in heavy weather. The AMERICAN ARGOSY and DART AMERICANA lost containers overboard. The KAMPEN sank off the southwest coast of Iceland on November 1 after reporting a 15° list. Apparently all crewmembers abandoned ship but seven perished.

Casualties--See the individual storms for casualties that were identified with them. There were two fog related casualties; the SAN BARTOLOME grounded in the Fowey River and the DORIS 1 and the CAMBRAE collided in Erith Reach.

The following ships suffered heavy weather damage. The BETHIOUA, HELLINIC EXPLORER, HOMERUS, LINDHOLM, MAERSK EXPLORER, MOHAWK, PRIDE OF TEXAS, TUG,VENUS, and RABIGH BAY 2.

The German cargo ship KAMPEN sank south of Iceland in rough seas up to 30 ft. Eight of the 15 crewmen were rescued. The BINGHAM and GALLATIN broke loose from their tow in heavy weather near 40°N, 63°W. The barge P8 broke adrift and went ashore on the Danish coast. The NAEROYSUND capsized and sank near 58°N, 06°E. A helicopter rescued the crew. The tugs NEWCASTLE and ARKANSAS collided on the Maumee River in a rainstorm.

WEATHER LOG, NOVEMBER 1983--This was a stormy month. The storm tracks were widely scattered but there were still several heavily traveled paths. There were anomalous areas with cyclones, as between the Azores and Spain, and a primary track from about 45°N, 40°W northeast to the Faeroe Islands. Other primary tracks were from eastern New York to Belle Isle, and Kap Farvel to Lofoten, Norway. One storm tracked southeastward from Lake Ontario, and then northeastward from off Cape Cod to off Hamilton Inlet where it abruptly turned southeastward to finally die out over Spain.

There were vast differences in the monthly mean sea-level pressure pattern and the climatic normal pattern (fig. 30). The Icelandic Low was displaced southwestward. Normally there is a 1003 mb center east of Kap Farvel and a 1005 mb center between Iceland and Nordkapp. This month there was a 1005 mb Low about 250 mi south of Kap Farvel and a 1006 mb Low near 48°N, 32°W. A deep trough penetrated to latitude 30°N where the Azores High is normally found. There was a deep anomalous 990 mb Low east of Novaya Zemlya.

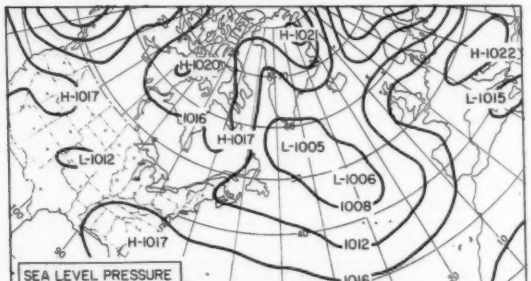


Figure 30.-- Mean sea-level pressure.

There was an anomalous 1022 mb High centered over Hungary. The normal 1015 mb Low off the toe of Italy persisted. There was an anomalous 1020 mb High near Baker Lake in central-north Canada. The 1019 mb Azores High was pushed 600 mi to the south of its usual position.

There were two exceptionally large negative anomaly centers, a 22 mb at 70°N, 60°E, and an 11 mb at 41°N, 29°W. In between these two negative centers there was a double centered positive 7 mb area that stretched from Scotland over Iceland and along the eastern coast of Greenland. There was also a 6 mb positive center over Foxe Basin north of Hudson Bay.

The upper air flow at 700 mb was near normal from the eastern United States to about longitude 30°W where there was a deep trough stretched from the Azores to a Low over Baffin Bay. An anomalous ridge extended northward from Algeria to northern Greenland. There was a deep Low over the Kara Sea.

Some Climatology. On November 1, 1861 a hurricane off Cape Hatteras battered a Union fleet attacking Carolina ports. On the 9th, 1913 a rapidly deepening cyclone caused high

winds on the Great Lakes. Eight ore carriers sank on Huron drowning 270 sailors. Onthe 13th, 1968 severe coastal storm produced high winds record early snows from Georgia to Maine. Winds reached 90 mi/hr in Massachusetts. On the 14th, 1974 a storm dropped 15 in of snow on the Buffalo, N.Y. airport and 30 in on the south of Lake Erie. On the 15th, 1900 a lake effect storm from Lake Ontario produced 45 in of snow in 24 hr.

Extratropical Cyclones--The month started with a large HIGH over Sable Island and a HIGH over Europe. There were LOWs along 60°N and 25° to 30°N. The HIGHs drifted eastward. A LOW southeast of Bermuda moved north-northeastward as the high-pressure weakened. A LOW off Portugal drifted northward, then southward, then eastward. At the end of the first week the HIGH over Europe was rebuilding. Another HIGH was plunging southeastward from Canada with a LOW over the Maritimes.

The second week the systems were elongated north-south. These was a string of LOWs along the west coasts of Europe. There was a skinny HIGH from Greenland to 20°N along 35° to 40°W. At midweek the midocean HIGH broke down with multi-pressure centers. These consolidated into larger circulations at the end of the week. A HIGH over Scandinavia moved southward to the North Sea. Another LOW was cutoff off Lisbon.

The third week found high pressure south of Iceland. The LOW off Lisbon was moving eastward. The Azores High was far south at 20°N. A LOW was moving eastward along 35°N and deepening. A deep LOW was moving northeastward inland of the North American Coast. At the end of the week there was a HIGH south from Greenland, deep LOW over Sweden, HIGH near Bermuda, and LOW dissipating over Spain.

The fourth week LOWs continued across the midlatitudes. There was high pressure over Europe and south of 30°N. A large cyclone with several centers developed midocean. A blocking HIGH was off the North American east coast and Spain. End of the week there was a more normal pattern with two large LOWs between 50° and 60° north, a Bermuda and Azores Highs. At the end of the month LOWs were moving over northern Europe and another LOW midocean.

This storm originated as a 1010 mb LOW in an inverted tropical wave near 23°N, 61°W. The TUNG LEE (30°N, 58°W) found 40-kn winds and 18-ft waves on the 3d. The storm was 982 mb at 41°N, 50°W at 1200 on the 4th. There were several wind reports near 50 kn mostly north and east of the center. A German ship measured 52-kn southeasterly winds and 23-ft seas near 43°N, 40°W. The 1200 chart of the 5th showed a 968-mb center near 47°N, 37°W and a second 975-mb center near 51°N, 35°W (fig. 31). There were many storm-force winds. The SEDCO 706 (47°N, 48°W) measured 50-kn northerly winds and 30-ft seas. CHARLIE measured 54-kn northerly winds and 31-ft seas. The AMERICAN LEGEND (46°N, 40°W) had 55-kn northwesterly winds and 41-ft seas and swells (fig. 32). Her waves were over 30-ft from 1200 on the 5th through 0600 on the 6th.

The AMERICAN ARCHER (47°N, 29°W) had 45-kn winds from the southwest and waves over 30 ft on

Figure 31.-- The 968 mb center was not visible at 1650. It was probably shielded by the clouds of the trough. Without ship observations it could not have been analyzed. NOAA.

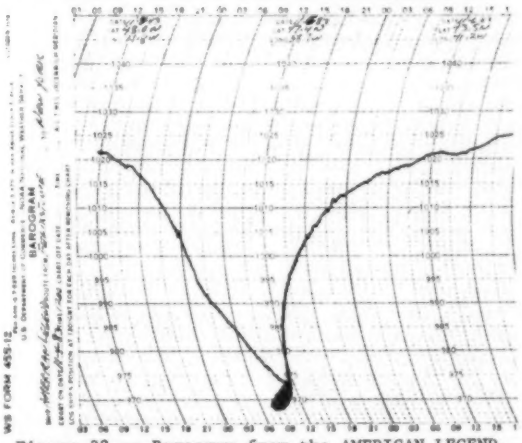


Figure 32.-- Barogram from the AMERICAN LEGEND.

the 6th. The AMERICAN LEGEND found 47-kn northwesterly winds, 38-ft seas, and 23-ft swells at 0600. The RAVENSCRAIG (55°N, 14°W) had 46-kn winds from the south, 33-ft seas and 23-ft swells from the southwest. At 1200 on the 7th the northern center was at 68°N, 02°W and the southern center near 56°N, 15°W. They had weakened considerably but there were still waves over 20 ft in the southwest quadrant. Both storms were gone on the 9th. The ALPINE STAR and ANBOTO appeared to have suffered weather damage in this storm.

This was the storm that survived 14 days from Lake Ontario to Spain taking the scenic route. The storm moved off Cape Cod on the 5th and turned northward, then northeastward on the 7th and again northward on the 8th. There were some gales during this time that increased to storm

force on the 8th. The two vessels CG2104 and CG2614 in the vicinity of Cabot Strait both had northwesterly 50-kn winds. The storm reached its most northerly position at 1200 on the 9th near 58°N, 54°W. The usual LOW would have dissipated by this time.

There was a complicated upper-air pattern at this time. There was a cut-off LOW off Portugal with a HIGH over Iceland, and a LOW connected with this surface LOW off the Labrador coast on the 9th. A ridge between the two upper air LOWs flattened and the circulation around the Labrador LOW was drawn southeastward rather than northward on the chart of the 10th. This resulted in a tilted omega block center over Iceland. The Labrador LOW started moving southeastward and the two upper-air LOWs joined into one on the 11th. The surface LOW following the upper air plunged southeastward and absorbed several smaller LOWs, expanded, and deepened. It was 980 mb at 1200 on the 11th. There were many gale-force winds. The NORWIK II (43°N, 10°W) measured 58-kn southeasterly winds. A French ship (41°N, 41°W) supposedly measured 74-kn winds from the northwest but only had 17-ft seas. This may be a case of wrong wind indicator. The AMERICAN ACCORD (42°N, 38°W) had 48-kn winds and 31-ft waves. Not far away the CORAL TEMSE also had 48-kn and 33-ft waves.

High winds and waves continued on the 12th. The AMERICAN ACCORD continued to have 30-ft waves. The TFL JEFFERSON (45°N, 41°W) found only 26-kn winds but 33-ft swells. The AMCO TRADER (43°N, 37°W) reported 57-kn north winds and 25-ft waves. On the 13th a 1038-mb HIGH over Norway began bulging westward over the LOW. A German ship near (39°N, 32°W) measured 39-kn winds and 30-ft swells. The AMCO TRADER now had 50-kn winds, 20-ft seas, and 26-ft swells.

The storm was weakening on the 14th as the HIGH to the north pushed westward. ROMEO had easterly winds with 23-ft waves. The storm drifted eastward over Spain and died on the 17th.

A weak low-pressure system moved northeastward out of the Gulf Coast States. As the system crossed the Appalachian mountains on the 16th two LOW centers formed. At 1200 one was near Lake Erie and the other near Long Island. The Lake Eric center was to become the primary center. The CHESAPEAKE (35°N, 72°W) had 45-kn winds with 15-ft waves. At 1200 on the 17th the storm was 990 mb near Quebec. Three Canadian ships all near 45°N, 63°W had 45-kn southeasterly winds. The FREDERICK CARTER (47°N, 60°W) measured 60-kn southeasterly winds. None of these reported waves. The RIGG at 44°N, 60°W measured 54-kn winds with 13-ft seas. On the 18th the AMCO VOYAGER (41°N, 63°W) had 45-kn westerly winds and 17-ft waves. Winds of 40 to 50 kn continued into the 19th. On the 20th, the POINTE SANS SOUCI (40°N, 52°W) measured only 20-kn winds but had 48-ft swells from the northwest. On the 21st, the RIGG (44°N, 60°W) claimed 33-ft swells from the north. Earlier a LOW had formed in the southern part of the circulation and was becoming the dominate storm.

Monster of the Month--As early as the 20th there was a broad-weak low-pressure system along latitudes 40°- to 45°N. Several weak LOWs formed, dissipated or moved generally eastward. By the 24th there was a string of three LOWs from 40°N, 45°W to Iceland. The overall cyclonic circulation reached from Nova Scotia to France and 25°N to 70°N. At times during the above period there were isolated reports of winds near 50 kn and waves to 30 ft.

On the 24th another LOW formed which was trackable and eventually became the primary cyclone. The CHELSEA (37°N, 41°W) reported 48-kn southwesterly winds. ROMEO had 23-ft seas. At 1200 on the 25th there were five LOWs stretching from 37°N, 39°W to west of Leningrad. The primary LOW was 986 mb near 52°N, 30°W. A ship near 44°N, 25°W had 50-kn winds on the 26th. At 1200 the LOW was 974 mb (fig. 33). CHARLIE had 48-kn northwesterly winds and 28-ft seas. The ATLANTIC SONG (55°N, 34°W) measured 52-kn winds and 26-ft waves. The VRNZ (55°N, 35°W) had 60-kn winds, 23-ft seas, and 43-ft swells. The AMCO TRADER (49°N, 09°W) found 45-kn winds, 20-ft seas, and 25-ft swells.

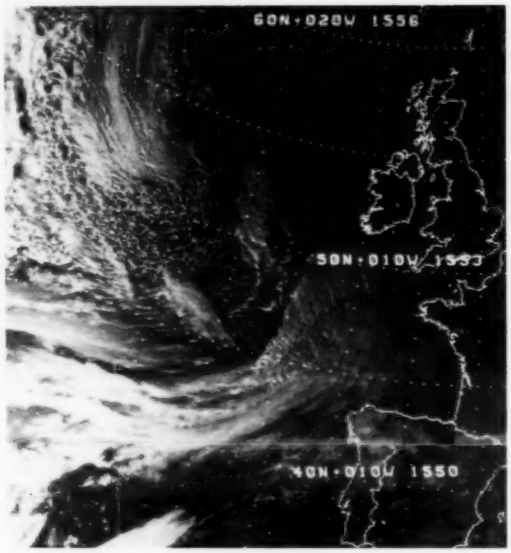


Figure 33.-- The center of the LOW is not clearly visible due to the low Sun angle this time of the year in this visible image. NOAA.

On the 27th yet another LOW center formed east of this one and took over the major circulation. There were many reports from west of the United Kingdom and the North Sea of 40- to 50-kn winds and above and waves 20 ft and over. The BROOMPARK (49°N, 09°W) reported 50 kn winds, 7-ft seas, and 49-ft swells. The systems were mostly over land on the 28th and of no concern to ships.

This storm raised havoc in western Europe, particularly the Bay of Biscay, English Channel, France, Low Countries, and Germany. Winds gusted up to 97 mi/hr over northern France. Seven people were killed in Belgium when trees crushed two cars. A tug sank at Antwerp. In northern

Germany the winds were over 110 mi/hr over high ground. In the southwestern areas winds gusting up to 75 mi/hr ripped off roof tiles and toppled trees. Two semi-trailers broke loose on the ferry SAINT PATRICK II in force 10 winds 2 hr out of Rosslare bound for Havre.

The crew of the SEMELI abandoned ship near 46°N, 08°W after developing a 25° list. The crew was rescued by helicopters and a life raft and put aboard the CO-OPERATOR II. A tug was attempting to tow the ship to port. Other ships damaged in this storm include the UGLAND TRAILER, DART ATLANTICA, LAILA, 6th OCTOBER, ORIENTAL CHIEF, SHERENE, ANTARES, GABARUS BAY, and HOPECLIPPER.

A front paralleled the Appalachian Mountains on the 25th and waves were forming on the front. One unstable wave continued to develop and was 970 mb over eastern Maine at 0000 on the 26th. There were many high wind and wave reports this day. The AJAX (37°N, 71°W) measured 37-kn winds with 33-ft swells. The RIGG (43°N, 62°W) measured 55-kn winds from 250° with 20-ft seas. An American ship at 39°N, 73°W reported 70-kn westerly winds but only 12-ft seas. Buoy 44004 measured 26-ft waves, and 44003 measured 25-ft waves. The long list of high winds and waves continued into the 27th. The ERIKA JACOB (39°N, 49°W) measured 60-kn westerly winds and 20-ft waves. The MOORDRECHT had 33-ft swells at 41°N, 53°W. The RIGG at 44°N, 61°W had northwesterly 63-kn winds. The storm was 973 mb at 52°N, 45°W at 1200 on the 28th. The ERIKA JACOB (39°N, 50°W) still reported 60-kn winds. The SEA-LAND PACER (39°N, 57°W) reported 20-ft seas and 33-ft swells. Most of the high winds were in the northwest quadrant. The storm dominated the northern and central ocean. On the 29th SEDCO 706 (47°N, 48°W) measured 62-kn northwesterly winds and 31-ft seas. SEDCO 710 damaged her anchor chains when she heaved in heavy seas. Two weeks later, she was delayed entering Marystown for repairs by high winds and heavy seas.

On the 30th another center formed 1,200 mi south of this center. The winds and waves were easing a bit but there were a few strong winds. An Icelandic ship TFAB (56°N, 09°W) measured 64-kn southeasterly winds. The storm moved against the southeast Greenland coast where it was absorbed by another LOW on December 2.

This LOW formed at a frontal occlusion over the West Virginia panhandle on the 29th. By 1200 on the 30th it was 985 mb over Cabot Strait. A RIGG at 44°N, 60°W measured 54-kn westerly winds and 13-ft seas. The MARINE NAUTIC A. (47°N, 59°W) had 55-kn winds. At 1200 on December 1 the 974-mb storm was near 54°N, 39°W. There were quite a few gale reports and 20-ft seas. The HUDSON (46°N, 40°W) had found 60-kn winds at 0600. At 1200 they were 45 kn with 20-ft seas. CHARLIE measured 45-kn southwest winds with 20-ft seas. At 0600 on the 2d the HUDSON reported 50-kn winds. The MONSOON (49°N, 35°W) had 40-kn winds, 20-ft seas, and 30-ft swells. At 1200 on the 2d the storm was 972-mb near 65°N, 30°W. A few hours later it stalled on the Greenland coast and rapidly dissipated.

Casualties--The following ships collided or grounded in fog: the LION, OCEAN CARRIER and CONSORTIUM 1, URALAR SEGUNDO and ANGLIA, and EVER LEVEL and ITAPAGE. The ARCTIC suffered ice damage on a voyage from Polaris, Canada. The "windmill" sailing ship CALYPSO put into Bermuda for repairs. The 44-ft cylinder used instead of a conventional sail was dislodged in 50-kn winds.

The following ships suffered weather damage: ANBOTO, DEVON III, DINNE, DOMAR COMMANDER and DOMAR 7001, HERMES, SPEY BRIDGE, and TARBELLA.

These ships had damage due to weather in the Mediterranean: BERNARDO DE ZAMACOLA, CARIBBEAN UNIVERSAL, DIAMOND MOON, NORDLAND, PONTOLAND, and RIO MAR.

WEATHER LOG, DECEMBER 1983--There appeared to be fewer major cyclones than usual this month. There were many more LOWs and frontal waves on the analyses than the track chart indicates but many were short-lived and not plotted. There was no primary track as the paths were widely scattered across the ocean. The only thing in common was a northeastward direction. There were two significant cyclones over the Mediterranean. There were some very intense HIGHs especially over the continents.

The subpolar Icelandic Low had three centers this month, a 996 mb near 61°N, 29°W, a 999 mb near 69°N, 05°E, and a 998 mb near 72°N, 50°E (fig. 34). Normally there are two 1000 mb centers near the first two. The Azores High was 1024 mb with two centers near 32°N, 29°W and 32°N, 48°W. A 1023-mb center was over Algeria. A huge 1031-mb HIGH was centered over the Yukon and bulged southward into the Great Plains. A 1042-mb HIGH over Central Asia bulged westward into Europe.

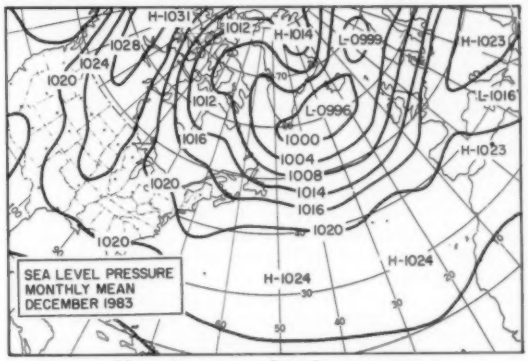


Figure 34.-- Mean sea-level pressure.

There were more anomaly centers than usual this month. There were three minus 4 mb centers over the north central ocean, 52°N, 22°W, 60°N, 28°W, and 57°N, 45°W. There was a large minus 12 mb center near 67°N, 55°E associated with the anomalous Icelandic Low center. There was a minus 6 mb center over Baffin Island. There was a plus 6 mb center over the Balkans, and another near 38°N, 50°W. The HIGH over the Yukon produced a plus 16 mb anomaly center with the plus 9 mb isoline at the Canada - United States boarder.

The gradient at 700 mb was much tighter than normal, 573 meters verse 465 meters. The circula-

tion center was normally located over Rowley Island in northeastern Canada. The flow across the ocean was generally east-northeastern from 35°N to 65°N.

Some Climatology. On December 5, 1917 a severe winter storm hit the Ohio Valley and Great Lakes region with 2 ft of snow and hurricane-force winds at Buffalo, NY. On the 12th, the first of three mid-Atlantic snowstorms dropped 12 in at Baltimore; Newark, NJ had 20 in with 50 mi/hr gusts. On the 26th, 1776 George Washington crossed the ice clogged Delaware River and marched on Trenton, NJ in the midst of sleet and snow. On the 31st, 1963 a snowstorm struck the deep south. Meridian, MS received 15 in of snow, Bay St. Louis 10.5 in, and 4.5 in at New Orleans.

Extratropical Cyclones--The month started out with multiple frontal waves and LOWs traveling northeastward from off the North American east coast to the Norwegian Sea. A large HIGH was over Europe. The first significant LOW was at midweek. The HIGH over Europe persisted.

The second week a deep LOW moved northward interior to the North American east coast. The HIGH over Europe built westward. There was a LOW over the Mediterranean. At midweek a LOW penetrated Europe. High pressure straddled the ocean centered between 40° and 45°N, diverting storms northward. At the end of the week another large HIGH came out of Canada. There was a deep LOW near Iceland and a HIGH over the Block Sea.

The third week found high pressure over Europe centered over the Block Sea and centered over the central ocean. A trough from a northern LOW stretched south off Spain. A LOW developed in this trough off Cape Finisterre. At midweek the HIGHs retreated and weakened and LOWs penetrated further south. A large multicentered LOW formed off Lands End. This large cyclonic circulation covered the ocean from shore to shore and 35° to 65°N at the end of the week.

A large LOW was centered near 55°N, 35°W early in the fourth week. A large cold HIGH covered the United States and Canada. There were many record low temperatures. At midweek there were many LOWs north latitude 40°N. At the end of the week there was a deep LOW over the Denmark Strait and a strong Azores High. At the end of the month high pressure centered over Bermuda and France once again forced the track of the LOWs northward. Cold high pressure again chilled the U.S. Strong LOWs were sweeping across the Norwegian Sea and northern Europe.

This first storm formed near Sable Island on the 3d. By 1200 on the 4th the storm was 990 mb near 45°N, 50°W. There were many strong winds, four 60 kn or greater. Two of them were the SEDCO 706 (47°N, 48°W) with 61-kn northeast winds and 17-ft seas, and the WEST VENTURE (47°N, 49°W) with 66-kn north winds and 20-ft seas. At 1200 on the 5th the storm was 976 mb near 47°N, 42°W. There were many storm-force winds this day and two of 60 kn. The TILLIE LYKES (42°N, 40°W) reported only 45-kn winds but at 1200 and 1800 she reported 43-ft seas and swells. The MERINO EXPRESS (42°N, 45°W) had 50-kn 290° winds and 28-ft seas. The HO MING No. 5 listed 35° when a cargo of lumber shifted while 225 mi south of Cape Race. Crew of 20 was evacuated by the IROQUOIS.

The storm was moving northeastward. There were no reported winds above gale force on the 6th. There were some 40-kn reports on the 7th. On the 8th this center was one of four embedded in a large cyclonic circulation that stretched to the Kara Sea.

The 9th was a bad day around the United Kingdom. At 1200 the storm was 986 mb north of London. Several ships either sank or were in trouble. The drilling platform SOVEREIGN EXPLORER broke her moorings in Holyhead harbor in force 8 winds gusting to force 11 and drifted. Tugs finally got the platform under control. The BEN VEEN had cargo shift in heavy seas. The ferry ANTRIM PRINCESS, north of Belfast had a fire in the engine room and lost power in storm force winds. All 108 passengers were rescued by helicopters. The KAREN FOLMER sank off Cherbourg. The JOSAL sank after a collision off the Spanish coast. The VIGILANT broke down in the Irish Sea and was in danger of drifting on the rocks. Helicopters rescued the 21 crewmembers. The REEVE had cargo shift off Lands End. The TFL EXPRESS (49°N, 07°W) measured 55-kn winds and 20-ft waves. The SYN PULKU (49°N, 09°W) measured 64-kn westerly winds. Early on the 10th rigs in the North Sea had gales but they had died down by mid-day as the LOW moved eastward.

There was a complicated frontal system parallel to the Gulf Coast and over Oklahoma on the 5th. The air mass contrasts quickly produced a large storm centered near Dayton, Ohio on the 6th. By the 7th the southerly circulation was off the East Coast. Strong winds with gusts swept many coastal stations; Cape Hatteras had 45 mi/hr, Nantucket Island - 67, Worcester, MA - 55, Schenectady, NY - 65, and North Adams, MA had 82 mi/hr winds. The AMCO TRADER (38°N, 70°W) had 65-kn southwesterly winds with 33-ft seas, and 26-ft swells. The CG 2389 measured 60-kn southeasterly winds near 45°N, 62°W. The TONCI TOPIC (47°N, 59°W) had 180° - 55-kn winds and 26-ft seas. At 1200 the LOW was 961 mb near 47°N, 69°W. The UNISOL went aground at Gaspe and broke in two. Helicopters rescued 35 people. The ALLEGRA F. went aground in Comeau Bay and was later refloated.

The storm was moving almost due north on the 8th. The GYPSUM KING (44°N, 64°W) had 60-kn winds from the southwest. There were many winds near 45 kn. The storm was northeast of Cape Chidley at 1200 on the 9th. The MEERKATZE (60°N, 47°W) measured 66-kn southeasterly winds and 23-ft seas. On the 10th the SOULOI (57°N, 58°W) had 50-kn winds and 23-ft seas. The storm was moving through Davis Strait on the 11th and died out near Thule on the 13th.

Monster of the Month--As the storm above moved northward a new LOW center formed near Sept Iles, Canada on the 10th. There were strong-gale to storm force winds blowing on the 11th. The GULF GATINEAU in the Gulf of St. Lawrence had 45-kn northwesterly winds. The CAPE ROGER (47°N, 56°W) measured 50-kn westerly winds and

20-ft seas. At 1200 on the 12th the storm was 956 mb near 58°N, 40°W. CHARLIE measure 50-kn westerly winds and 26-ft seas. The CHAMPLAIN (55°N, 40°W) had 66-kn southwesterly winds and 33-ft seas. The WALTHER HERWIG (59°N, 45°W) had northeasterly 67-kn winds and 23-ft seas. Later in the day CHARLIE had 43-kn winds, 25-ft seas, and 39-ft swells. The CHAMPLAIN had 70-kn winds and 39-ft seas.

High winds and wave continued at CHARLIE - 50 kn and 41 ft - through the 13th. The PEP ICE (58°N, 41°W) measured 52-kn northwesterly winds. The BAMSA DAN (59°N, 43°W) had 45-kn northwesterly winds and 33-ft seas. LIMA also measured 50-kn southwesterly winds and 23-ft waves.

The storm was 964 mb near 63°N, 21°W at 1200 on the 14th. High winds and waves continued. The AMERICAN ARCHER (47°N, 10°W) had south-southeasterly 45-kn winds and 25-ft waves. The GULA (58°N, 06°W) had 35-ft waves. The WINTER STAR (42°N, 26°W) had 20-kn winds 10-ft seas and 49-ft swells. The FRITHJOF (59°N, 45°W) measured 63-kn northwesterly winds and only 17-ft seas.

The central part of the storm weakened as it broke into two centers on the 15th. There were still high winds and waves in the tight gradient hundreds of miles from the centers. CHARLIE still had 30-ft swells. The TFL ENTERPRISE (42°N, 24°W) measured 54-kn winds and 23-ft waves. The WINTER STAR still had 36-ft swells. The AMCO VOYAGER suffered damage from the 14th to 16th. The ABULWAFA had cargo shift in the Bay of Biscay.

On the 16th the southerly second center was becoming the primary storm. ROMEO had 20-ft seas, and the ROYAL PRINCE (46°N, 09°W) had 28-ft waves. Swell waves up to 20 ft were occurring as far south as latitude 35°N. The storm's center moved northward, then westward and southward to combine with a frontal wave off the Labrador Sea on the 17th. At 1200 on the 18th the 952-mb storm (fig. 35) was near 50°N, 13°W and extended westward to Newfoundland and southward to latitude 33°N. The LEADSMAN had complete electrical failure off Lands End in force 10 to 11 winds, very rough sea and swell. The ULTIMA had cargo shift and lost overboard the 15th to 21st and had to divert to Lisbon.

Figure 35.-- An infrared image would have shown this storm much clearer.in the northern latitudes. NOAA.

On the 18th a selective printout of ship reports listed 36 reports of 45-kn or greater or 30-ft waves or greater and only the highest one that a ship reported that day is listed. There were two 60-kn wind reports, a 74-kn, and a 72-kn. The highest waves were 39-ft swells by the RUDDBANK (47°N, 10°W). The New York PMO, Robert Baskerville sent me barograms from the CHERRY VALLEY with a minimum pressure of 955 mb (fig. 36) and the SEA-LAND INDEPENDENCE--953 mb (fig. 36), both near Lands End. The SEAFORTH JARL sank off St. Johns night of 18th. Crew abandoned ship and were rescued by the ARTIC SHIKO. Crew had survival suits.

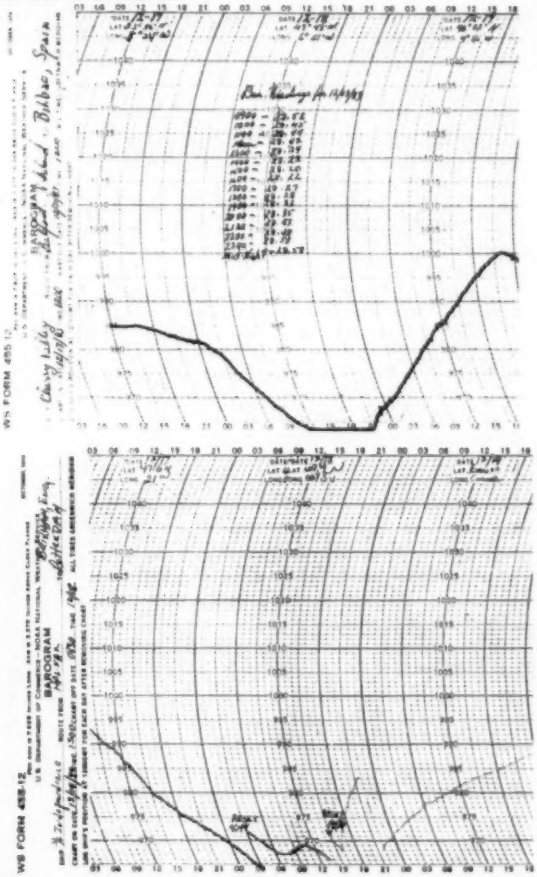


Figure 36.-- Barograms from the CHERRY VALLEY and SEA-LAND INDEPENDENCE only a few hours and miles apart.

The storm had again broken into four centers on the 19th. The highest winds appeared to be 50 kn and waves 49 ft near 44°N, 17°W. At 0000 on the 20th the SEA PRINCESS (43°N, 26°W) had northwesterly 70-kn winds, 46-ft seas, and 56-ft swells. The SEA-LAND VENTURE (48°N, 37°W) had

40-kn winds and 30-ft swells. The AMCO VOYAGER (42°N, 27°W) had 50-kn winds and 41-ft swells. The GVDM (43°N, 19°W) also had 50-kn winds and 41-ft swells.

This storm rapidly weakened on the 21st as it moved northeastward over the North Sea. Another severe storm was approaching from the west.

This incipient LOW formed in the trough of a LOW that was south of Kap Farvel and still part of the major cyclone described above on the 20th. A Gulf of Mexico frontal wave was traveling northeastward toward this trough which was between two large HIGHs. Observations at 1200 from the WEST VENTURE, KYEK, and BUGAEV aided the analyst in identifying the small circulation. There were already 40-kn winds and 20-ft seas in the area. By 1200 on the 21st the storm was 952 mb near 53°N, 35°W. The center was almost directly over CHARLIE which recorded a sea-level pressure of 952.2 mb, and 35-kn east winds. The T. AKASAKA (48°N, 37°W) had 50-kn westerly winds and 30-ft waves. The MEDITERRANEAN HIGHWAY (49°N, 41°W) had 33-ft seas and swells. At 1800 the TFL FREEDOM (49°N, 20°W) had 53 kn winds, 30-ft seas, and 36-ft swells. On the 22d the storm was circling counter clockwise around CHARLIE. At 0000 CHARLIE had 48-kn winds, 23-ft seas, and 26-ft swells. The northerly circulation with this LOW extended westward to Nova Scotia, and the southerly circulation to Ireland. There were many wave reports of 20 ft. The LOW was still 954 mb. By 1200 the storm's center had risen to 973 mb but the gradient to the west had intensified as high pressure drifted eastward and the storm was circling westward and then southward. There were numerous storm-force reports. SEDCO 706 and WEST VENTURE both were near 47°N, 48°W and reportes measured 77-kn and 63-kn winds respectively, both reported 35-ft seas. The WGZL also near 47°N, 48°W measured 80-kn northwesterly winds and 38-ft seas. The GBYV (44°N, 45°W) measured 63-kn winds and 46-ft swells.

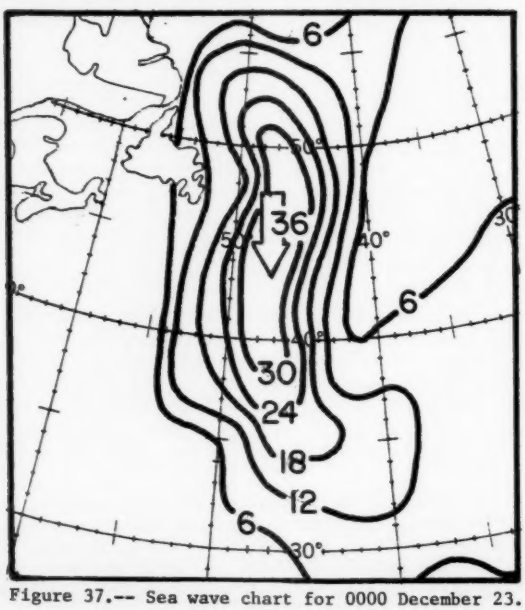


Figure 37.-- Sea wave chart for 0000 December 23.

On the 23d the storm was headed northeastward again. There were still many high winds and waves in the west to southwest quadrant (fig. 37). The SEA-LAND LEADER (36°N, 44°W) measured 60-kn winds from the northwest, 13-ft seas, and 41-ft swells. The AMCO VOYAGER (37°N, 39°W) reported 43-ft swells. The ANDES DISCOVERED (36°N, 40°W) had 46-ft swells and a SHIP at 40°N, 40°W had 51-ft swells. The storm weakened rapidly on the 24th as it traveled west of Ireland. Early in the day there were still storm-force wind reports and the AMCO VOYAGER still had 39-ft swells. After 1200 the storm was just another weak LOW. It appears that the LADY, BREIZH-IZEL, BUNGA ORKID, and NUEVO EBENECER suffered weather damage in this storm.

A frontal wave formed on the 23d as the front moved over the Gulf Stream off the Carolinas. There was a large 1050-mb cold HIGH over the Midwest that was feeding very cold air off the coast. The morning of the 25th there were 128 record low temperatures set for the day, many of which were records for the month. The S.A. CONSTANTIA lost containers overboard and other damage about 200 mi north of Bermuda. The MERCS RUHUNU sent a distress message due to a 30° list from cargo shifting north of the Bahamas. At 1200 on the 25th the storm was 956 mb near Argentia, Newfoundland. There were many high winds and waves Christmas Day. The ferry IMPERIAL BEDFORD was reported to have lost its anemometer when the winds hit 100 kn in Cabot Strait with 961 mb sea-level pressure. A RIGG at 44°N, 58°W measured 75-kn winds with 21-ft seas. The TFL LIBERTY (47°N, 51°W) measured 60-kn southwesterly winds and 26-ft seas. Another ship nearby had 62-kn and 20-ft seas. The AMCO VOYAGER (37°N, 47°W) had 50-kn southerly winds 10-ft seas, but 41-ft swells.

The storm was leaded directly toward Kap Farvel on the 26th. At 1200 the storm was 936 mb near 62°N, 38°W. Another center had split off on the west coast of Greenland. The DART CANADA (47°N, 50°W) measured 60-kn winds from the west. The MAGNUS JENSEN (60°N, 34°W) measured 70-kn winds from the southwest, no waves reported. The AMCO VOYAGER took the prize for high 39-ft waves.

On the 27th the winds decreased considerably but there were still many reports of waves over 20 ft. The IMMORTAL TURTLE grounded off the Netherlands. On the 28th CHARLIE still had 25-ft swells and LIMA 20-ft swells. There were gale reports up to 45-kn on the Norwegian Coast. This LOW had died out but another carried the circulation to Nordkapp.

This LOW formed near Cincinnati, Ohio on the 28th. It raced northeastward up the St. Lawrence River valley and was 989 mb at 1200 on the 29th. There were several reports near 50-kn. The GYPSUM KING was one of them. On the 30th the WGZL (47°N, 48°W) measured 55-kn winds from 200° and 12-ft seas. CHARLIE had 40-kn winds with 21-ft seas. By the 31st 30-ft swells had

formed and LIMA now had 25-ft seas and 28-ft swells. The SUDERLAND (58°N, 09°W) measured 60-kn winds from the southwest. The storm had split on southern Greenland late on the 30th.

On New Years day the SVANUR (61°N, 15°W) found 60-kn winds. CHARLIE and LIMA continued to have waves over 20 ft. At 1800 LIMA had 41-ft swells. Many platforms in the North Sea had gale to storm force winds. On January 1, 1984 a LOW center east of Iceland deepened and moved eastward. The western center remained stationary near the Denmark Strait until the 2d when it started moving east-southeastward and deepening. The DART AMERICANA (49°N, 29°W) had 50-kn winds, 33-ft seas, and (code 36) 59-ft swells. The swells were reported as 62-ft at 1800. Romeo had 30-ft seas. Strong southwest winds continued over the North Sea.

At 0000 on the 3d the storm was 946 mb near the Shetland Islands. The DART AMERICANA was still sailing northward into 25-ft seas and 56-ft swells. ROMEO had 33-ft seas. A ship near 60°N, 15°W had 50-kn winds and 26-ft seas. LIMA had 25-ft swells. To the south the C. P. VOYAGEUR (49°N, 12°W) had 23-ft swells, and ROMEO had 36-ft waves. North Sea platforms recorded many strong-gale and storm-force winds with waves up to 30 ft. These continued into the 4th. The storm was well into the Soviet Siberia on the 5th.

The following ships had weather damage from December 31 to January 3 from this storm. They were the CASTOR, ALEKSANDR BOGOLYUBOV, MAERSK RANGER, KEFLAVIK, WARSCHAU, ROLLNES, and EVA THOLSTRUP.

This bad weather was from an anticyclone rather than a cyclone. High pressure of 1049 mb moved off the U.S. East Coast on the 21st and another 1062-mb HIGH centered over Yukon Territory, Canada bulged southward over the Rocky Mountains and Great Plains. The air with this system was extremely cold. Freezing temperatures reached the Gulf Coast on the 22d. By 1200 on the 24th the 1063-mb HIGH was over Montana. Freezing temperatures plunged deep into Florida and south Texas causing extensive citrus damage. Christmas evening and Christmas day record low temperatures were recorded at 128 weather stations, many records for the entire month. For the country as a whole it was the coldest for at least 53 yr.

The cold weather froze large lakes and rivers completely over. Traffic on the Great Lakes was hit bad. Fifteen freighters on Lake Erie had to be freed by an icebreaker. The E. B. BARBER was trapped at the entrance to the Detroit River. The EDWIN H. GOTT grounded on Lake Superior. Barge traffic was hampered on the Illinois and Mississippi Rivers. The ELTON HOYT had weather damage in Lake Huron the 21st. The ALGOWOOD was caught crossways in ice in Livingstone Channel. The PHILIP R. CLARKE was holed in the forepeak. The J. W. MCGIFFIN sustained ice damage to the wheelhouse.

The HIGH moved off the Georgia Atlantic coast on the 27th allowing some warming to occur east of the Rocky Mountains. See Editors Desk item on 1983-84 winter.

Casualties--In addition to those ships listed with the individual storms these also suffered weather damage: CAT ISLAND, CONSTELLATION ENTERPRISE, CASTILLO DE LOPERA, ELFWAIHAT, HAVFRAKT, HOPE CLIPPER, LADY CATHERINE, NEA TYHI, OLMECA, OLYMPIC LEADER, ORE, UNISOL, AND WHITE FOX.

There were quite a few casualties in the Mediterranean, most probably due to thunderstorms: ALEX G., ALMAR, HERCULUS, LIBRA, MARE PRIDE, MYRTIDIOTISSA II, NAVY PROGRESS, PETRA SCHEU, SEA OSPREY, SHEIKH ALI, and SYROS.

North Pacific Weather Log

October, November and December 1983

EATHER LOG, OCTOBER 1983--There were slightly fewer major cyclones over the primary shipping lanes than the climatological normal indicates. There was a mass of storms that moved in various directions over the Sea of Okhotsk. The primary storm paths were short as the tracks fanned out in various directions. One was from east of Tokyo northeastward to near 44°N, 165°E, another was from near Adak Island eastward, then northeastward, into the Gulf of Alaska. Other storms entered the Gulf from the southwest. There were two cutoff LOWs off California. The Tokyo path matched climatology closer than any others.

There were two Aleutian low-pressure centers (fig. 38). A 1002 mb south of Seward, Alaska which matched the 1001 mb climatic center, and a 1003 mb center over the Sea of Okhotsk which had no climatic counterpart. The Pacific High was 1024 mb near 34°N, 160°W, 20° longitude west of its normal position and 5 mb higher, and a 1022 mb High center near 35°N, 177°W.

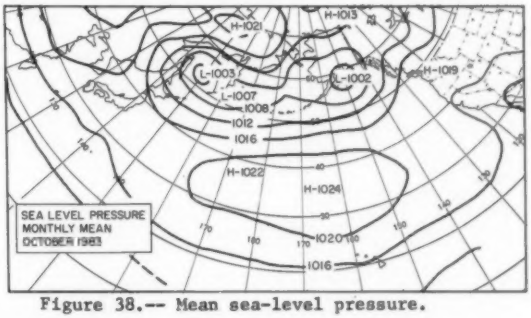


Figure 38.-- Mean sea-level pressure.

The largest anomaly center was minus 9 mb over the Sea of Okhotsk, in connection with the swarm of storms over that area. The displaced-stronger Pacific High produced a large plus 6 mb center near 40°N, 160°W. There also was a plus 7 mb center over the Siberian, Arctic coast near 170°E.

The 700 mb upper-air flow was mainly zonal from Japan to 150°W between latitudes 35°N to 50°N. The usual trough line paralleled the west coast of Alaska. There was an anomalous LOW over the Sea of Okhotsk matching the surface LOW. The departures were mostly positive except for a negative area with the Sea of Okhotsk LOW and an area off the California coast.

Typhoons Ida, Lex, and Marge along with tropical storms Herbert, Joe, and Kim occurred over the western ocean. The eastern ocean produced hurricanes Raymond and Tico, with tropical storm Sonia.

Some Climatology--On October 12, 1962 the Great Columbus Day windstorm struck west of the Cascade Mountains. Winds reached hurricane force with gusts over 100 mi/hr. Much timber was blown down, communications disrupted, 48 lives lost, and $210 million damage.

Extratropical Cyclones--The month started with a strong storm over midocean that traveled into the Gulf of Alaska. It is described under September storms. The cyclone was followed by a large 1046-mb HIGH into the central ocean. There were weak centers over the western ocean. At the end of the week there was a LOW over the Sea of Okhotsk and a cutoff LOW between Hawaii and northern California.

The second week a LOW formed off Honshu and moved north-northeastward to the Bering Strait. The cutoff LOW was still drifting off northern California. There were two large HIGHs along latitude 40°N, one north of Hawaii and another north of Marcus Island. At midweek there were many weak pressure centers. By the end of the week the LOWs were consolidating and intensifing.

The first really severe storm came over the Tsugaru Strait the third week. At the end of the week there were many low-pressure centers north of latitude 35°N. Raymond was approaching Hawaii.

Beginning the fourth week there was a large strong LOW over the Gulf of Alaska and another at midweek. A strong HIGH was now over the central ocean with a weak Pacific High. At the end of the week there were two strong LOWs over the ocean and two more the end of the month.

This was a small quick storm. It formed as a frontal wave on a front from a LOW over the Bering Sea, late on the 10th. It was 994 mb near 59°N, 155°W at 1200 on the 11th. At 1800 the SURVOYOR (57°N, 148°W) measured 52-kn winds with 21-ft waves. At 0600 on the 12th her winds were 57 kn with 12-ft waves. The CHEVRON CALIFORNIA (59°N, 147°W) had 50-kn winds, 17-ft seas, and 33-ft swells at 0000. The storm moved over the State and into the Yukon by the 13th.

The Sea of Japan gave birth to this storm on the 13th. It moved across the Tsugaru Strait on the 14th. The SHIKISHIMA MARU (45°N, 156°E) measured 55-kn northwesterly winds west of the storm. The waves were 26 ft. By 0000 on the 15th the LOW was 972 mb near 49°N, 166°E. The ALASKA MARU (44°N, 163°E) had 50-kn winds and 23-ft waves. At 1800 the PRESIDENT GRANT (42°N, 160°E) measured only 15-kn winds, 3-ft seas, but 33-ft swells. The storm was tracking along the Aleutians on the 16th. A small LOW had developed in the circulation east of this center. The GLACIER BAY (57°N, 140°W) found 45-kn easterly winds with 25-ft waves. At 1200 on the 17th the storm was 982 mb near 54°N, 158°W. The stronger winds were only gales. The storm gradually fell apart as it moved across the Gulf of Alaska and disappeared on the 20th.

On the 19th there were four low-pressure centers north of latitude 45°N between the Asian and North American coasts. The 1800 analysis found another weak center near Atka Island in the Aleutians. An upper-air LOW had moved over the area and with this support the surface LOW deepened and expanded rapidly. By 0000 on the 21st it was 975 mb near 54°N, 155°W. There were several reports near 50 kn this day with waves up to 23 ft. One of these was the SEA-LAND FREEDOM at 51°N, 150°W. Buoy 46003 measured 23-ft waves.

The storm was 970 mb at 0000 on the 22d (fig. 39). The FALMOUTH BAY (53°N, 155°W) measured 60-kn winds and 30-ft seas. The OJI GLORIA (54°N, 148°W) measured 49-kn winds from the west, 25-ft seas, and 41-ft swells from west-southwest. There were other reports in the 40-kn category. The storm was dissipating on the 23d but at 0000 the GLACIER BAY (57°N, 140°W) had only 35-kn winds with 30-ft swells, and the WESTWARD VENTURE (58°N, 147°W) found 48-kn winds and 17-ft seas. The storm was gone by the 24th.

Figure 39.-- Note where the cold air streams over the relatively warmer water of the Bering Sea south of the Bering Strait. Clouds of instability stream for to the southeast. NOAA.

This LOW closed off in a trough over the Kuril Basin on the 20th. The DOMINA (36°N, 160°E) found 48-kn southwesterly winds on the 21st. At 0000 on the 23d the 992-mb LOW was at 49°N, 174°W. The NEW INDEPENDENCE (42°N, 179°W) had 20-ft swells. There were a few minimal gales.

The 1200 analysis showed two centers to the storm which persisted for 24 hr. On the 24th the PACMERCHANT (48°N, 46°W) found 55-kn winds from the southwest. The SEA-LAND PATRIOT (43°N, 162°W) measured only 32-kn winds but her swells were 33 ft. Later in the day, the NEPTUNE JADE measured 56 kn. The OHSHU MARU at 52°N, 138°W measured 43-kn winds, 12-ft seas, and incredible 56-ft swells.

There were several reports on the 25th of gale force winds and high swells. The HANJIN INCHEON (48°N, 141°W) had 33-ft swells, the DAFFODIL (54°N, 145°W) also 33 ft, and the MEONIA (49°N, 136°W) 33 ft. Buoy 46004 also measured 33 ft. The storm rapidly deteriorated on the 26th.

A multicentered large LOW was the origin of this storm. There were three low-pressure centers between 55° and 60°N and Kamchatka and Alaska, on the 26th. At 1800 another center formed at a frontal occlusion near 53°N, 160°W. By 0000 on the 28th this center had absorbed the other centers and was near 58°N, 146°W. The PORTLAND (53°N, 135°W) measured 50-kn southerly winds with 20-ft swells. The B. T. ALASKA (56°N, 140°W) had 45-kn winds and 17-ft waves. By 0000 on the 29th the storm was a weak pressure center.

The cyclonic circulation generated in the col area between two HIGHS produced this cyclone on the 27th. By 1200 the TOWER BRIDGE (41°N, 150°E) measured 49-kn northwesterly winds south of the center. At 0000 on the 28th the 978-mb storm was near Ostrov Simushir. The SEA-LAND LIBERATOR (48°N, 156°E) had 50-kn winds, 25-ft seas, and 30-ft swells. Other ships had storm-force winds and waves over 20 ft. The SEA-LAND LIBERATOR (47°N, 157°E) had 45-kn winds and 30-ft swells at 0000 on the 29th and 47-kn winds with 23-ft swells at 1800. Another LOW had developed east of this center and raced eastward.

This second center was near 49°N, 153°W by 0000 on the 31st. The QUEENS WAY BRIDGE (42°N, 152°W) was about 400 mi south of the center and measured 60-kn westerly winds and 17-ft waves. On November 1 the storm was breaking up.

This storm formed over Hakkaido on the 28th. It expanded rapidly over the Kuroshio Current. The ARCTIC TOKYO (50°N, 160°E) measured 58-kn easterly winds with 20-ft seas on the 30th. On the 30th, a frontal wave moved northeastward through the southeast quadrant and was 500 mi east of the original center at 0000 on the 31st. The AL ZAHRA (42°N, 175°E) south of the new center had 33-ft swells. The OJI GLORIA (50°N, 157°E) had 30-ft swells northwest of the original LOW. A ship near 45°N, 159°E measured 56-kn winds.

On November 1 the 970-mb storm was at 51°N, 172°W. The storm now consisted of several subcenters and the circulation reached the Canadian coast. The MOBIL ARCTIC (54°N, 139°W) had 50-kn easterly winds and 15-ft seas. The NEW APOLLO (54°N, 170°W) measured 62-kn winds. A British ship near 54°N, 161°W measured 50-kn winds and 25-ft seas. There were still gales on the 3d but the storm was weakening near 55°N, 145°W. It was stationary the next 48 hr. Buoy 46003

Figure 40.-- Soviet icebreakers clear a path through the thick ice of the Chukchi Sea. Many Soviet freighters were stuck in the ice by an early freeze and shifting of the ice. Some were stuck for as long as 3 weeks. WIDE WORLD PHOTO.

had 21-ft waves. The waves were severe on the 4th, the B.T. ALASKA had 44-kn winds from 180° and 33-ft swells. The YOCONA (51°N, 154°W) measured only 29-kn northwesterly winds but 36-ft swells. The storm dissipated on the 5th.

Many Soviet ships were trapped in ice off the Siberian coast in the Chukchi and East Siberian Seas during October (fig. 40). The ships were supplying cities in the far north. At one time as many as 90 ships may have been involved but only 40 to 50 were in serious trouble.

An unusual summer in which the pack ice did not recede as far from the coast as usual and early severe cold caught the convoys. The ice was reported to be from one meter to 5 meters thick. One ship, the NINA SAGAYDAK had her hull crushed and she sank. All crewmen were rescued. The KOLYA MYAGOTIN had her hull split but made it to safe water. Many ships were damaged. Ice breakers were immobilized at times and also suffered damage. The LENIN lost a propeller.

By midmonth half the ships were rescued. The worst ice appeared to be in the vicinity of Longa Strait separating Wrangel Island from the Mainland. There were also problems with river boat traffic as the rivers froze early. By the end of the month it appeared all the vessels had been freed of the ice.

Casualties--The Brooklyn sustained heavy weather damage south of Valdez on the 3d. The HENNA and JAGAT VIJETA also had weather damage. The KYODO MARU had cargo collapse due to heavy rolling in high waves and sank. The tug EAGLE capsized and sank in heavy seas 70 mi southeast of Yakutat on the 27th. The ZAHA No. 3 grounded at Okinawa in strong winds. The STAR LUZON was survey at Yokohama for weather damage. The NEPTUNE CORAL lost containers overboard.

The GLOMAR JAVA SEA (fig. 41 and 42) sank in typhoon Lex in the South China Sea on October 25. All 81 crewmembers were drowned.

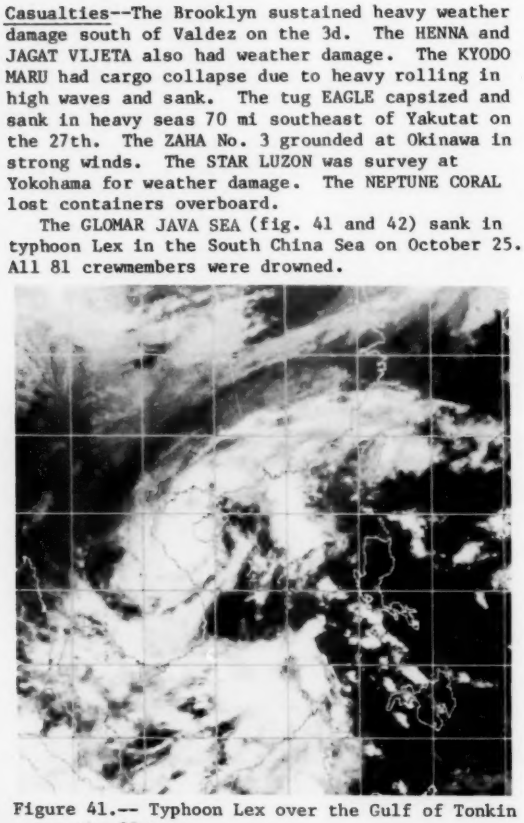


Figure 41.-- Typhoon Lex over the Gulf of Tonkin on the 25th.

Figure 42.-- A file photo of the GLOMAR JAVA SEA. Over fifty bodies were later found on the ship by divers. WIDE WORLD PHOTO.

WEATHER LOG; NOVEMBER 1983--There were two primary tracks this month, one stretched from east of Northern Honshu eastward to about 145° where it started turning gradually northward to cross land near Dixon Entrance. The other was from southern Kamchatka and along the Aleutians to south of the Alaska Peninsula where the storms turned counter-clockwise back to the west. At least seven storms turned back westward, often a few will but this was at least twice the usual number. The storms had a more easterly track out to about 145°W and were deeper than normal.

The monthly mean pressure pattern featured a 989 mb Aleutian Low near St. Paul Island (fig. 43). This is 10 mb lower than the climatic Low southeast of Kodiak Island. This was the primary feature from coast to coast north of 30°N. The Pacific High was 1021 mb near 28°N, 133°W, 300 mi southeast of its climatic position and 1 mb higher.

There was a minus 13 mb anomaly center between Saint Matthew Island and Nunivak Island. There also was a minus 10 mb center about 300 mi west of

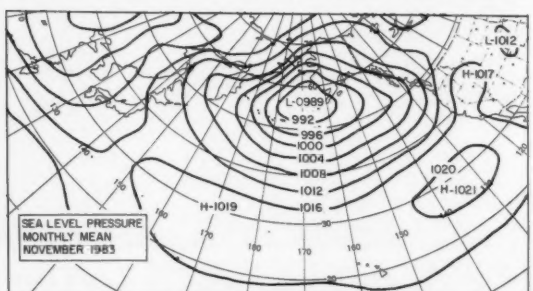


Figure 43.-- Mean sea-level pressure.

Port Alice. The pressure anomalies were negative north of latitude 30°N.

In the upper air at 700 mb there was an anomalous 2,680 m LOW over Saint Matthew Island. The flow was zonal from Japan to 130°W between latitudes 30° and 50°N. The usual ridge was over the North American west coast and more pronounced in the north over Alaska.

There were four tropical cyclones over the western North Pacific; typhoons Orchid and Percy; and tropical storms Norris and Ruth. The eastern North Pacific produced tropical storm Velma.

Some climatology. On November 7, 1940, the Galloping Gertie bridge at Tocoma, WA collapsed in strong winds, just 4 months after opening.

Extratropical Cyclones--The month started with a large LOW over the eastern ocean, a weak Pacific High, and another LOW over the southwestern ocean. Typhoon Marge was over the Philippine Sea. The second half of the week there were weak multiple pressure centers that consolidated by the end of the week into LOWs over the Bering Sea and Gulf of Alaska with the Pacific High Building.

There were again multiple pressure centers the second week and the Pacific High was weakening. By midweek there were three strong LOWs east of the Data Line as a strong HIGH moved out of Asia. The end of the week found a string of LOWs southwestward from the Gulf of Alaska, then westward to Hokkaido.

This string of LOWs combined into one large cyclonic circulation east of 180° and north of latitude 30°N with multiple centers the third week. There was high pressure east of Japan and a LOW over the Sea of Japan. The end of the week found a large LOW over the central ocean and a 1034 mb Pacific High.

The fourth week the Pacific High was blocking cyclones at midocean where they turned northward. The HIGH was weakening at midweek and a deep LOW was over the Aleutian Islands. At the end of the week high pressure remained off the U.S. West Coast. there were four LOWs west of 150°W. At the end of the month the LOWs had combined into one large LOW centered over the Bering Sea. High pressure was over Japan, the interior North American west coast and south of latitude 30°N.

This was one of the more southerly tracking storms this month. It originated southeast of Tokyo on the 1st and crossed the British Columbia coast on the 7th and continued inland.

On the 2d the JUPITER No. 5 (35°N, 153°E) measured 57-kn northwesterly winds. Another ship (DGFS) at 36°N, 159°E measured 52-kn easterly winds and 20-ft seas. Three hours earlier her winds were only 40-kn. At 0000 on the 3d the storm was 990 mb near 40°N, 170°E. This day there were two reports of very high swell waves. At 0500 the SEA FAN sent a special observation from 35°N, 172°E of 26-kn southwest winds, 35-ft seas (???) and 38-ft swells. The KINKO MARU (37°N, 171°E) at 0600 reported 29-kn measured wind, 7-ft seas,and 33-ft swells.

The storm was 990 mb near 42°N, 146°W at 0000 on the 5th. There were several high wind and wave reports this day. The 7KBW had 55-kn northwesterly winds and 20-ft waves near 53°N, 148°W. The ANCO ANCHORAGE (50°N, 129°W) measured 58-kn winds and 15 ft waves. The ATLANTIC WING (39°N, 135°W) measured only 26-kn southwesterly winds, 10-ft seas, but 36-ft swells.

On the 6th buoy 46005 measured 26-ft waves at 0000 and 1200 and probably in between. There were many other high wind and wave reports. The highest wind was 70-kn from the west near 48°N, 134°W with 33-ft. seas by the SAMOA. The storm weakened rapidly as it moved ashore at 0000 on the 7th.

This storm moved into the Sea of Okhotsk from Manchuria on the 3d. Early on the 5th the PRESIDENT GRANT was sailing southwestward along the Kurile Islands (49°N, 156°E) and measured 55-kn northwesterly winds and 17-ft. waves. The LEXA MAERSK (50°N, 161°E) found 48-kn winds and 23-ft seas. At 0000 on the 6th the storm was 968 mb near 55°N, 178°E. The GCSG (53°N, 174°E) measured 50-kn westerly winds, 13-ft seas, and 23-ft swells. The storm started weakening on the 7th but there were still a few gales. The VAN FORT (54°N, 150°W) measured 47-kn southeasterly winds and 20-ft waves. The storm broke into multiple centers on the 8th.

A fast developing storm. A closed LOW formed at the occlusion of a front near 39°N, 153°W early on the 7th. It almost jumped to 49°N, 144°W by 1200 on the 8th at 980 mb. The stronger winds and higher waves were in the southerly flow. The BARBARA TAIF (39°N, 140°W) had 45-kn southeasterly winds and 17-ft seas. The ATLANTIC WING (32°N, 157°W) measured 28-kn southwesterly winds, 8-ft seas, and 30-ft swells. The EXXON NEW ORLEANS (46°N, 131°W) measured 55-kn southwesterly winds, and 13-ft seas.

On the 9th the GOLDEN GATE BRIDGE measured 54-kn westerly winds, 13-ft seas, and 33-ft swells at 0000. The BARBARA FOSS (59°N, 151°W) measured 52-kn easterly winds and 17-ft seas. At 1200 the LOW was 968 mb near 52°N, 148°W (fig. 44). The NEWARK (58°N, 146°W) had 40-kn easterly winds, 20-ft seas, and 36-ft swells. The storm weakened rapidly on the 10th as it turned westerly and was stationary over Bristol Bay for 3 days.

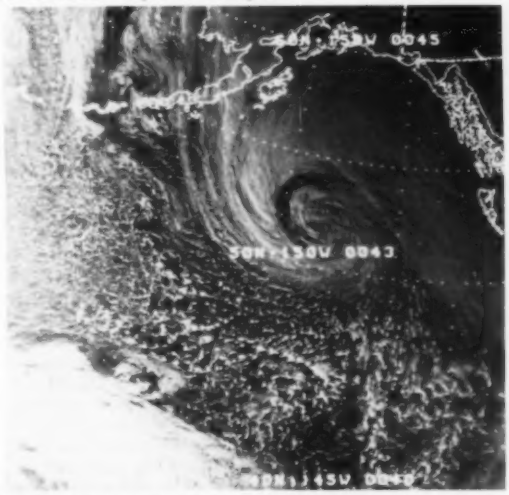


Figure 44.-- Ship observations correctly located the surface center. NOAA.

This was the extratropical extension of typhoon Marge. By 0000 on the 8th the tropical storm had become extratropical near 40°N, 167°E. There were a few gales. A ship (H9VM) near the front had 40-kn winds, 20-ft seas, and 25-ft swells. These were two reports of high swells, probably the remnants of Marge. The 7JNA (35°N, 142°E) reported 30-ft swells and the HOTAKA MARU (36°N, 145°E) reported 49-ft swells. The storm was racing eastward under 90-kn west winds at 700 mb. At 0000 on the 9th the storm was 984 mb near 41°N, 164°W. Several ships reported 40 to 50-kn winds at 1800. The JIKF had 50-kn at 32°N, 144°W with 17-ft waves. On the 10th there were many winds in the strong gale category, several reports of waves up to 30-ft. Two ships reported 60-kn southerly to southeasterly winds. The MIDAS SEINE (40°N, 137°W) measured 60-kn southeast winds. The EXXON NEW ORLEANS (40°N, 125°W) measured 60-kn from the south with 33-ft waves. The storm was now curving northward. The eastern circulation was against the coastal mountains on the 11th and the friction draining the storm. There were several storm-force wind reports. The NPFD reported 55-kn southerly winds off the Columbia River with 26-ft waves. The CHEVRON COLORADO (42°N, 127°W) had 30-ft swells and the MOKU PAKU (33°N, 132°W) had 33-ft swells. On the 12th the storm was gone. The ORCHID II lost logs overboard on 10th and 11th off Cape Beale. The WESTWARD VENTURE lost three trailers overboard on the 9th off Cape Beale.

This storm formed as a second LOW in an older cyclonic circulation over the Bering Sea on the 10th. Its formation south of the old center tightened the gradient to the south and there were some gales. On the 11th there were still gales and the ELBE EXPRESS (45°N, 161°W) measured 52-kn northwest winds with 26-ft swell waves. A ship near 43°N, 176°E found 36-ft swell waves. There were two wind reports over 50-kn on the 12th, one was 52 kn from the southeast by the GALVESTON (53°N, 132°W). The storm was 984 mb near 43°N, 138°W at 0000 on the 13th. There were several gale-force and higher wind reports. One was for 60-kn west winds by the BOGASARI DUA (44°N, 129°W) with 33-ft seas and 30-ft swells. There was another report of 30-ft seas near 41°N, 137°W by buoy 44006 at 0000 and 1200. The storm rammed ashore near Vancouver Island on the 14th.

Northern Manchuria produced this 20W on the 15th. On the 18th it was 980 mb near Sakhalin Island. This was already a large-strong storm. There were many strong gale-to storm-force wind and high wave reports. The NEPTUNE TURQUOISE (35°N, 144°E) measured 47-kn winds, 30-ft seas, and 36-ft swell, all from the south. The PRESIDENT TYLER (51°N, 158°E) measured 50-kn northeasterly winds, 8-ft seas, and 26-ft swells. The KAPOR and NIIHAMA MARU No. 23 collided after a mooring rope broke in high winds at Akita, Japan. The TREASURE STAR lost a radar mast out of Akita and diverted to Niigata. The CIUDAD DE POPAYAN apparently suffered weather damage in this storm from the 17th to the 19th. On the 19th the AD ASTRA (36°N, 152°E) measured 41-kn westerly winds, 17-ft seas, and 39-ft swells. There were at least 24 reports of winds over 44-kn and/or waves over 29 ft this day around this storm. The ship BICC (41°N, 175°E) measured 62-kn winds from the southwest with 38-ft seas and swells. The PRESIDENT JEFFERSON measured 65-kn south winds 21-ft seas, and 25-ft swells.

On the 20th the storm was 964 mb near 47°N, 176°E. At 0000 the PRESIDENT JEFFERSON (40°N, 176°W) now had 40-kn southerly winds, 41-ft seas, and 43-ft swells. The waves decreased to 33-ft at 0600 and 1200. The SOCONY VACUUM (48°N, 171°W) had 55-kn winds from the south, 18-ft seas, and 35-ft swells.

The storm sometimes had double and triple LOW centers. By the 21st the northern one of a double center became the primary center. The storm was still 964 mb but fewer high winds and waves. The BICC (41°N, 172°W) measured only 28-kn winds but her swells were 49 ft. The SOCONY VACUUM (46°N, 166°W) now had 35-kn gales, 17-ft seas, and 30-ft swells. On the 22d the OVERSEAS JUNEAU (58°N, 142°W) had 40-kn winds from the south-southeast, 17-ft seas and 33-ft swells. On the 23d a weak sorm moved north through the Bering Strait.

At 0600 on the 22d a frontal wave was analyzed near 39°N, 157°E. It developed rapidly moving northeastward and was 976 mb near 45°N, 170°E at 0000 on the 23d. The JAPAN ROBLE (36°N, 165°E) found 55-kn northwesterly winds, 43-ft seas, and 26-ft swells. The 7KFY measured 61-kn winds from 170°, 23-ft seas and 26-ft swells at 0300. At 0000 on the 24th the storm was an extreme LOW of 950 mb over Kiska Island. The CANAL ACE (55°N, 176°W) measured 60-kn easterly winds, 28-ft seas, and 31-ft swells (fig. 45). A ship near 48°N, 166°E claimed they measured 74-kn westerly winds. Another ship 7KBW at 42°N, 163°W also claimed measured 74-kn winds from 160°. Neither reported waves. The ASIA WINDS (39°N, 179°E) had 30-ft waves. There were many high winds and waves reported.

The LOW was filling on the 25th and weakening.

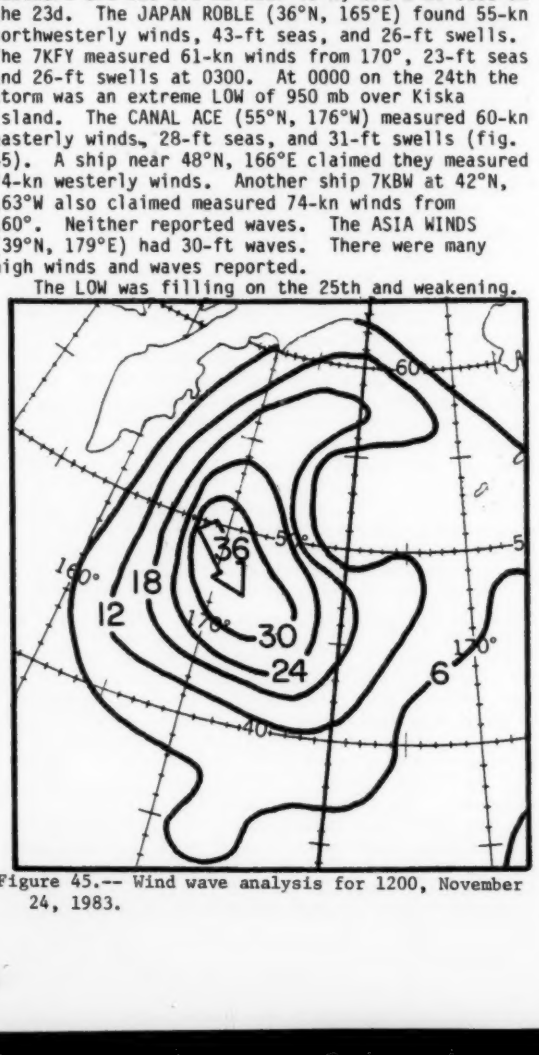


Figure 45.-- Wind wave analysis for 1200, November 24, 1983.

The ASIA WINDS still had 33-ft swells. A Korean ship claimed 80-kn winds near 48°N, 173°E. The storm disappeared as another storm moved through the southern circulation.

This storm consisted of a series of LOWs involved in the overall cyclonic circulation. The first LOW of the series formed over Shikoku on the 23rd. The CLIFFORM MAERSK (35°N, 150°E) had 55-kn southerly winds on the 24th. It traveled northeastward and on the 25th was 972 mb near 49°N, 154°E.

There were gale-to storm-force winds on the 25th. The IBARAKI MARU (45°N, 154°E) had 58-kn westerly winds, 17-ft seas, and 30-ft swells. The OCEANIA MARU (35°N, 164°E) measured 60-kn southwesterly winds and 17-ft seas.

At this time another LOW formed around the frontal occlusion. This LOW raced eastward. The LA CONDESA (46°N, 173°E) had 43-kn westerly winds and 38-ft seas. The PRESIDENT JOHNSON (39°N, 175°W) found 45-kn westerly winds, 17-ft seas, and 35-ft swells.

On the 27th, the DUBHE (36°N, 173°W) measured northwest 51-kn winds, 20-ft seas, and 23-ft swells. The ANNIE JOHNSON (43°N, 149°W) had southeast 45-kn winds and 39-ft seas. The storm had turned northward and was now turning westward. There were mostly gales on the 28th. The WILLIAM E. MUSSMAN measured 30-kn southwesterly winds, 12-ft seas, and 33-ft swells. The CHARLOTTE MAERSK (40°N, 161°W) also had 45-kn southwesterly winds, 13-ft seas, and 33-ft swells. At 0000 on the 29th this LOW was down to 950 mb after taking the usually deadly westerly track. Another LOW had moved through the southerly circulation. The original LOW which had looped over the Sea of Okhotsk was now entering the southwest circulation almost as a trough. This cyclonic circulation covered most of the ocean north of latitude 30°N, except for a high-pressure area over Honshu.

The PACEMPEROR (39°N, 160°W) measured 42-kn winds and 33-ft swells on the 29th. The PACIFIC PRESTIGE (34°N, 160°E) measured 45-kn northerly winds, 13-ft seas, and 39-ft swells. The GALVESTON (59°N, 151°W) had 60-kn east-northeasterly winds, 7-ft seas, and 38-ft swells from the east. There were fewer high winds on the 30th, mostly in the southerly flow. The GALVESTON still had 60-kn and 33-ft swells. The SAN DIEGO (55°N, 141°W) had 58-kn winds from the southeast and 26-ft waves. The ALASKA MARU (34°N, 135°W) and the CHEVRON CALIFORNIA (51°N, 149°W) both had 30-ft swells.

On December 1 there were two 968-mb LOWs with the storm, one over the Bering Sea and the other near the Shamagin Islands. Two ships reported high swells. They were the FAIRWAY (53°N, 156°W)-30 ft, and the PRESIDENT ADAMS (54°N, 172°E)-35 ft. On the 2d, a ship that could not be identified by name at 54°N, 154°W measured 50-kn winds, and another near 52°N, 148°W had 26-ft swells. The storm was gone by the 3d.

This LOW broke out of the southeastern edge of the large storm described above. It formed at a frontal occlusion on the 29th near 42°N, 140°W. At 0000 on the 30th the storm was 988 mb near 43°N, 134°W. The ALASKA MARU (34°N, 135°W) had 38-kn winds with 30-ft swells. Buoy 46006 reported 16-ft waves. The TIEN SHIN (38°N, 131°W) had 360°, 13-kn winds with swell waves of 30-ft from 310° on the 1st. The CRISTOBAL MARU (34°N, 130°W) had 26-ft swells. Another LOW had formed south of this one and on the 1200 chart of December 1 the southern center was primary. Both centers disappeared by the 3d.

At approximately 1745 on November 30 the MORMAC STAR was anchored at Diego Garcia when an earthquake was recorded on their barograph (fig. 46). They did not report any damage or evidence of a tsunami.

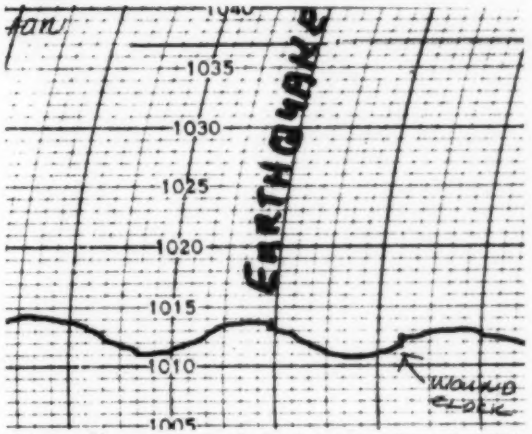


Figure 46.— A part of the barogram from the MORMAC STAR anchored at Diego Garcia at 1745, November 30, when an earthquake occurred.

Casualties--The BLUE MAGPIE struck a jetty at Yaguina Bay while trying to enter in bad weather. The vessel broke in two (fig. 47) and spilled part of her cargo of oil. Helicopters rescued the 19 crewmembers.

On November 3 the ferry SANTO NINO capsized in strong winds off Samar Province, Philippines. She had about 6° passengers aboard, 12 bodies were recovered. The BASILIAN caught fire and sank off the Philippines after huge waves swept the ship and forced open a hatch cover, the date unknown. Forty-two crewmen were rescued. The EVANGELOS D. sent an SOS after the main engine shaft broke in heavy weather off Hong Kong on the 19th. The MANULANI lost seven containers overboard in heavy seas off Grays Harbor, Wash. on the 17th. The MINORIES PRIDE sought refuge at Punta Eugenia on the 8th after suffering heavy weather damage. The barge SEASPAN 376 had damage at Port Mellon on the 15th when struck by high winds and rainstorm. The SEVEN SUPERSTAR was struck by high waves while anchored and loading logs off Aparri, Philippines and damaged her rudder and steering gear. Huge waves shipped into open cargo hatches and she foundered on the 17th. The tug TANGINGUE capsized and sank on the 9th in heavy weather in the vicinity of Santiago Island. The GRAZIELLA FERRAZ returned to Long Beach on the 17th after sustaining damage in heavy seas.

The following ships were reported to have heavy weather damage at unspecified times and/or place: ASAHI MARU, BERING SEA, BUNGA SEROJA, CRAZY HORSE, EASTERN GRAVE, LANKA SRIMANI, and STAR VISAYAS.

Other Casualties. The SIMAR capsized at jetty Westernport during storm winds on the 8th. The WILLIAM DAMPIER broke away from moorings during strong-gusty winds at Botany Bay on the 8th.

Figure 47.-- The BLUE MAGPIE struck the jetty at Yaquina Bay while seeking shelter from a Pacific Storm and broke in two.

WEATHER LOG, DECEMBER 1983--There were no primary storm paths this month. The tracks tended to rapidly curve northward primarily depending on the location of high pressure. More than the usual number of cyclones formed near midocean. There was a slight concentration of tracks from about 35°N, 160°W eastward toward northern California. Alaska, the eastern Bering Sea and the Gulf of Alaska were notable for their lack of storms. There was also a slight concentration of tracks from off Tokyo east-northeastward to near 48°N, 175°W.

The mean sea-level pressure pattern differed greatly from climatology north of latitude 40°N (fig. 48). There was one 995 mb Aleutian Low center near 52°N, 162°E rather than the two of 1001 mb and 1002 mb, in the Gulf of Alaska and Attu Island, respectively. There was a 1031 mb HIGH over the Yukon northeast of Whitehorse. The Pacific High was 1021 mb and near normal at 30°N, 130°W. A 1042 mb HIGH was over central Asia.

The most significant sea-level pressure anomaly center was plus 16 mb near the center of the 1031 mb HIGH. The zero isoline extended westward from

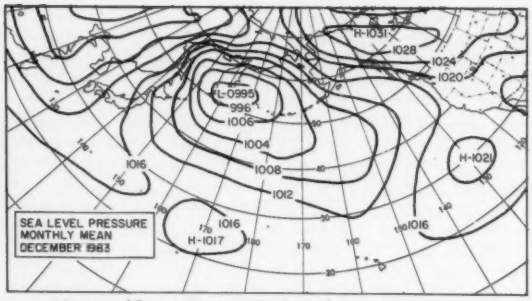


Figure 48.-- Mean sea-level pressure.

Portland Oregon to 50°N, 165°W then northward to 180° and the Arctic Circle. North and east of this line the pressures were above the normal or average. There was a minus 10 mb anomaly center off the tip of the Kamchatka Peninsula, and a minus 8 mb center near 38°N, 155°W.

The upper air flow was near normal west of 170°E with a Low center over the Sea of Okhotsk. East of 170°E there was a large sharp ridge over the Bering Sea, Alaska, and Western Canada. There was an anomalous 2,950 meter High center near Valdez. There were anomalous troughs eastward from the Low along 50°N and another southward along 160°W from 50°N.

There were three tropical cyclones over the Noth Pacific. Tropical storms Sperry and Thelma over the west and hurricane Winnie over the east.

Some climatology--On December 11, 1932 very cold weather prevailed along the West Coast. San Francisco had nearly an inch of snow and the temperature at the airport dipped to 20°F.

Extratropical Cyclones--December started out with a large LOW over the western ocean and a large strong Pacific High. The LOW was over the Bering Sea the end of the first week with multiple centers. A weak Pacific High was off California. There was a strong HIGH over the Arctic that extended into Canada.

The multiple LOW centers pattern persisted into the second week. The Arctic High was keeping the LOW centers further south than normal. At midweek the pressure patterns were near normal. There was high pressure east of Japan. A strong storm was forming over Japan and another over midocean. At the end of the week there was a strong LOW over the Bering Sea. The Pacific High had built off California.

The third week there were several LOW centers with a storm dissipating. The Arctic High was moving into Canada. At the end of the week a strong LOW was near 50°N, 180°. There was a 1060-mb HIGH over the Yukon with a ridge extending south to latitude 20°N. This blocking HIGH turned storm centers northwestward. There were multiple pressure centers the western two-thirds of the ocean.

The fourth week a 1065 mb HIGH persisted over the Yukon. A southward extending pressure ridge was moving eastward over the Great Basin leaving a weak Pacific High off Baja California. A strong HIGH moved out of northern China. There were multiple LOW centers near midocean. At midweek a strong LOW controlled the ocean. A LOW moving

toward the California coast turned northward along the edge of the Arctic High. At the end of the week there were LOWs scattered along latitude 35°N. The Arctic High had built west over the Bering Sea parallel to 65°N. The primary center was still over the Yukon and feeding extremely cold air southward east of the Rocky Mountains. At the end of the month the Arctic High center had moved southeastward to the Great Plains. A large multi-centered cyclone covered most of the Pacific north of latitude 25°N to the Bering Sea.

This storm moved into the Sea of Okhotsk from Asia on December 1. The PRESIDENT WASHINGTON near the Korea Strait had 51-kn winds. The LIONS GATE BRIDGE (40°N, 146°E) measured 46-kn westerly winds and 23-ft waves. The VAN HAWK found 31-ft swells near 48°N, 155°E. On the 2d there were two LOWs in the center with another at the occlusion. The STAR SINGAPOR measured 60-kn winds near 37°N, 154°E. The NEPTUNE PAVO (40°N, 152°E) measured 40-kn winds with 25-ft seas, and 33-ft swells. The GALLEON DIGNITY (48°N, 156°E) measured 50-kn, 33-ft seas, and 36-ft swells.

On the 3d the storm was stationary near 53°N, 155°E at 964 mb. The PRESIDENT HOOVER (53°N, 166°E) measured only 25-kn southwesterly winds, 8-ft seas, but 31-ft swells. The 4th found the FRIENDSHIP (46°N, 155°E) with 48-kn westerly winds and 15-ft waves, while the PRESIDENT ADAMS (46°N, 152°E) measured 45-kn winds, 13-ft seas, and 35-ft swells. On the 5th the storm was 954 mb near 54°N, 176°E. The TOWER BRIDGE (53°N, 175°E) measured 57-kn northwesterly winds. The 6th the storm was 958 mb over the central Bering Sea. The KOREAN ZIRCON (54°N, 179°W) measured 68-kn westerly winds while only a short distance away the STAR DOVER (54°N, 178°W) estimated 47-kn westerly winds. Neither reported waves. By late in the day the storm was rapidly dissipating.

This small but powerful storm formed off the Oregon coast on the 7th at the point of occlusion of a front out of a LOW near 50°N, 151°W. At 1800 a ship near 53°N, 145°W measured only 32-kn south-easterly winds, 7-ft seas, but 30-ft swells. Southeast winds had been blowing in the area for over 24 hr. The small storm was 970 mb at 47°N, 132°W at 0000 on the 8th (fig. 49). There were two 60-kn wind reports; one by the MOBIL ARCTIC (46°N, 130°W) with 30-ft waves, and the other by the QUEENS WAY BRIDGE (35°N, 140°W) with 26-ft waves. The storm broke up on the coast on the 9th. The barge SEASPAN RIGGER broke tow and went aground near Cape Beale. The log deck cargo on the PACEBARONESS shifted on the 8th and she deviated to Vancouver.

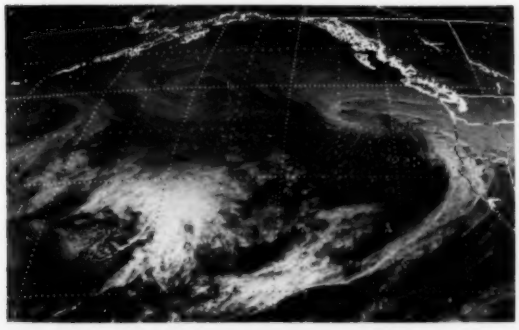


Figure 49.-- Three low pressure centers in a line approximately along latitude 50°N. NOAA SMS.

This potential storm was first analyzed over the Inland Sea on the 7th. There were a few high winds on the 9th. The 70-kn wind from the GREEN FORTUNE (38°N, 159°E) right in the center of the storm (993 mb) seemed high. The storm was analyzed as 992 mb. The KOTA SENTOSA (37°N, 149°E) sent a special 2200 observation of 13-kn winds, 15-ft seas, and 43-ft swells. There were strong-gale and storm-force winds on the 10th and 11th. At 0000 of the 12th the storm was 966 mb near 44°N, 166°W. There were 40-to 50-kn winds and swells up to 30 ft. The ATLANTIC CHARITY (40°N, 168°W) had 55-kn westerly winds and 34-ft seas (fig. 50). There were many 20-to 25-ft seas south and southwest of the center. The ADVISER (37°N, 179°W) found 20-ft seas, and 30-ft swells. By the 13th the storm was weakening and disappeared that day.

A storm moved eastward out of Manchuria on the 10th and rapidly intensified over the warmer ocean. The GINI contacted a light buoy near Kobe in strong winds. At 0000 on the 12th the storm was 965 mb near 46°N, 152°E. High winds and waves had now formed. The PACMAJESTY measured 48-kn southerly winds with 20-ft seas, and 39-ft swells (fig. 50). The PRESIDENT LINCOLN measured 55-kn winds, and 20-ft seas. The SAMOA (38°N, 162°E) had 58-kn southerly winds and 20-ft seas. The SEA-LAND INNOVATOR (43°N, 160°E) measured 56-kn, 250°, winds with 33-ft swells from 200°. The weather station on Ostrov Urup measured 50-kn. At 0000 on the 13th the 954 mb storm was at 50°N, 162°E. There were many strong winds and high waves reports. The SEA-LAND INNOVATOR now measured 60-kn westerly winds, 26-ft seas, and 33-ft swells. A ship, 7KGD at 51°N, 165°E had 32-kn southerly winds, 33-ft seas, and 41-ft swells from 140°. The storm was filling on the 14th but there were still storm-force winds and waves over 30 ft. The SEA-LAND ENDURANCE (50°N, 164°E) measured 41-kn winds with 23-ft seas and 35-ft swells. The CHINESE ship BICC (50°N,161°E) reported 39-ft seas, and 33-ft swells.

On the 15th the SEA-LAND ENDURANCE was at 48°N, 156°E with measured 55-kn winds and 30-ft seas. On the 14th and 15th a frontal wave was moving through the southern and eastern circulation and by 1200 on the 16th was the primary circulation. The GOLAR ROBIN (53°N, 179°W) had 33-ft wells. The new LOW

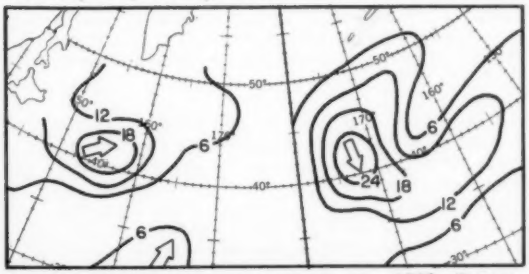


Figure 50.-- Wind wave analysis for 1200, December 12.

rapidly dissipated.

A frontal wave formed on the 17th in an area of flat gradient between the Asian High, a maritime HIGH, an extratropical LOW over Kamchatka, and tropical storm Thelma. The storm drifted northward into the main zonal upper-air flow and on the 18th and 19th sped northeastward. On the 18th the EASTERN PACIFIC (39°N, 147°E) had 30-ft swells from the west. On the 19th the ORIENTAL EXECUTIVE (51°N, 162°E) measured 56-kn winds. A ship near 36°N, 177°E had 30-ft swells.

At 0000 on the 20th the storm was 952 mb near 49°N, 176°W. There were storm-force winds and the CHASTINE MAERSK at 48°N, 177°W measured 60-kn northwesterly winds. Adak Island registered 55-kn winds from the northeast. The storm was turning northwestward as it pushed against the 1060 mb HIGH centered over the Yukon. On the 21st the NEW APOLLO (52°N, 157°W) had 35-kn southeasterly winds and 30-ft seas. The GALLEON HONOR was over 1,000 mi south-southeast of the storm's center with 49-ft swell waves from 310°. The storm was over eastern Siberia on the 22d.

These strong winds were associated with the strong HIGH centered over the Yukon rather than the two LOWs that were south and west of the HIGH. The HIGH existed near the North Pole from the first of the month. The HIGH drifted south and crossed Mackenzie Bay on the 15th. It settled in over the Yukon and fluctuated around 1060 mb until it started breaking down near the end of the month and a center broke off and moved southeastward to the Great Plains. As the cyclone described above moved northwestward the HIGH maintained a tight gradient in the west to south quadrant.

Some samples of the observations are: on the 20th the BARBARA FOSS measured 55-kn southeast winds near 59°N, 152°W. The SIENNA (52°N, 151°W) measured 51-kn on the 21st. There were many high winds and waves on the 22d. The BENJAMIN HARRISON was probably in this area when she had weather damage. The DOUBLE EAGLE (54°N, 166°W) radioed a report of 40 to 60-kn southeast winds to WBH-29 Kodiak. The YOCONA (55°N, 157°W) had 45-kn east winds and 30-ft swells. The EASTERN DIAMOND (50°N, 155°W) measured 30-ft swells and buoy 46003 had 25 ft. The 23d and 24th were also bad days (fig. 51). The YACONA continued with 33-ft swells. The ROSE (38°N, 142°W) had easterly 45-kn winds and 30-ft seas. The PACNOBLE measured 58-kn east winds and 23-ft waves near 49°N, 150°W. On the 25th there was a LOW southwest of the HIGH and another to the south. Most of the higher winds were now closer to the centers of these cyclones, but the fishing vessels DOUBLE EAGLE (55°N, 162°W) and INVADER (56°N, 141°W) reported 40-to 60-kn winds with swell to 12 ft.

This LOW formed about 800 mi east of Tokyo along with frontogenesis that stretched to the south of Kyushu. As usual the seemingly insignificant observations from three or four ships helped the analyst discover the formation of this LOW. On the 21st a Soviet ship measured northerly 48-kn winds. The JAPAN AMBROSE had 45-kn winds south of the center. The NEDLLOYD KATWIJK (39°N, 177°E) found 45-kn northwest winds and 23-ft waves on the 22d. The 7KBW (38°N, 178°W) had 55-kn winds at

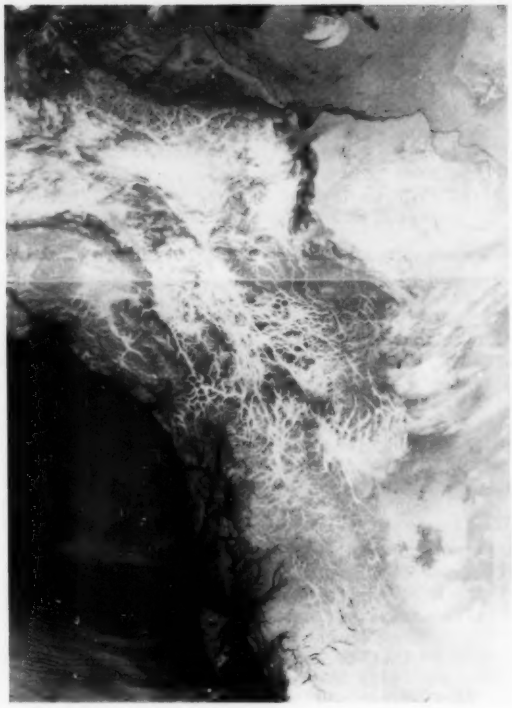


Figure 51.-- The cold almost clear Yukon where the intense cold HIGH stagnated. NOAA-8 AVHRR, Vis.

2100. On the 23d her winds were 50-kn with 21-ft waves. A Japanese ship at 39°N, 179°E measured 50-kn southwest winds, 25-ft seas, and 30-ft swells.

On the 24th there were strong winds northeast of the LOW center toward the high pressure. The storm was 984 mb near 45°N, 169°W. The ZENKOREN MARU (45°N, 162°W) measured 48-kn easterly winds and 20-ft waves. The TOYOTA MARU (48°N, 157°W) had 40-kn east winds, 20-ft seas, and 49ft swells on her port bow. The MIJDRECHT southwest of the center had 40-kn northwest winds, 18-ft seas, and 26-ft swells.

The HIGH was bulging west and southward forcing the LOW to the south. On the 25th the PRESIDENT JEFFERSON (35°N, 162°W) had 55-kn east winds and 10-ft waves. At 0000 on the 26th, the storm was 980 mb near 34°N, 169°W. A ship near the center reported 33-ft seas. The highest wind was 48-kn. The EVER SPRING (30°N, 164°W) reported 38-ft waves. The storm rapidly disappeared on the 27th.

There were three cases of Tehuantepecer winds this month. These are formed when high pressure pushes south over the Gulf of Mexico as a northern which crosses the Isthmus and blows through the gap between the Mexican and Guatemalan mountains. It blows up to 100 mi out into the Gulf of Tehuantepec.

The first case was forecast to occur on the 17th, but no ship reports were received. The second was on the 24th and 25th as the extremely cold HIGH from Canada was over the central United

States. The EXXON NORTH SLOPE (14°N, 96°W) had 46-kn northeast winds with 5-ft seas, and 31-ft swells. The third case was on the 30th as another cell of that Canadian cold HIGH pushed south. The SUNBELT DIXIE reported north winds of 50-kn at 13.5°N, 94°W on the 30th and 57-kn winds at 14°N, 95°W on the 31st. No waves were reported.

Casualties--The following ships suffered weather damage this month. They were the LUNAR VENTURE, BUNGA CHEMPAKA, NORDIC PATRIOT, STAR CENTAURUS, BUNGA ORKID, FLORANI, and LANKA SRIMATHI. The tug HOZAN was missing in heavy weather off Cheju Island. The GREEN MERCURY capsized and sank south of Kyushu.

A San Francisco pilot buoy broke loose on the 3d as a small intense storm moved ashore to the north. The pipe laying barge KILCHIS grounded north of Monterey during this storm.

Other Casualties--The CHI GRAND encountered heavy weather from the 5th to 12th. On the 8th a bolt on the shaft coupling broke, later two more bolts broke. The VENTURE STAR grounded on Vio Island in strong offshore winds. The ATLAS VAN DIEMAN lost an anchon in Bass Strait on the 22d.

Hurricane Alley

Dick DeAngelis
National Environmental Satellite, Data, and Information Service
Washington, D.C.

The tropical cyclone tracks (fig. 52) and summaries are based upon information provided by Ted Tsui of the Naval Environmental Prediction Research Facility, the Joint Typhoon Warning Center, the Hong Kong Royal Observatory, the Eastern Pacific Hurricane Center, the Central Pacific Hurricane Center and the Fiji Meteorological Service. Detailed summaries for Eastern and Central North Pacific tropical cyclones may be found in the annual articles on page 67 of this issue. The Southern Hemisphere cyclones, except for Atu, must be considered preliminary due to lack of final information. Table 6 provides a 3-mo. summary.

TROPICAL CYCLONES--OCTOBER 1983

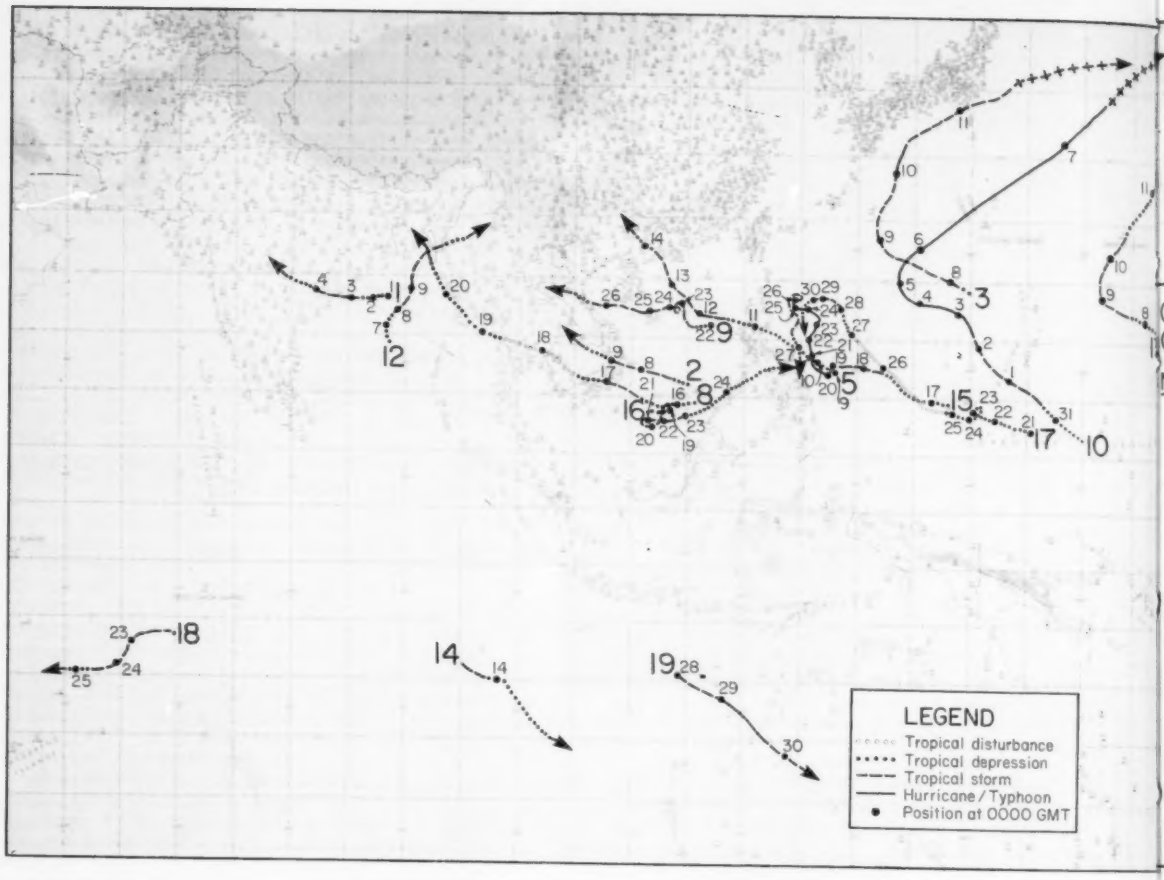
During this month normal activity is about nine tropical cyclones of which five reach hurricane intensity, with most activity confined to the Northern Hemisphere. This year was close to normal with ten tropical cyclones of which six reached hurricane strength. The North Pacific Ocean spawned nine storms while one developed in the North Indian Ocean. Of the western North Pacific cyclones Marge attained supertyphoon intensity with 145-kn winds while the other five were tropical storms or minimal typhoons (fig. 53). However, typhoons Lex received the most publicity.

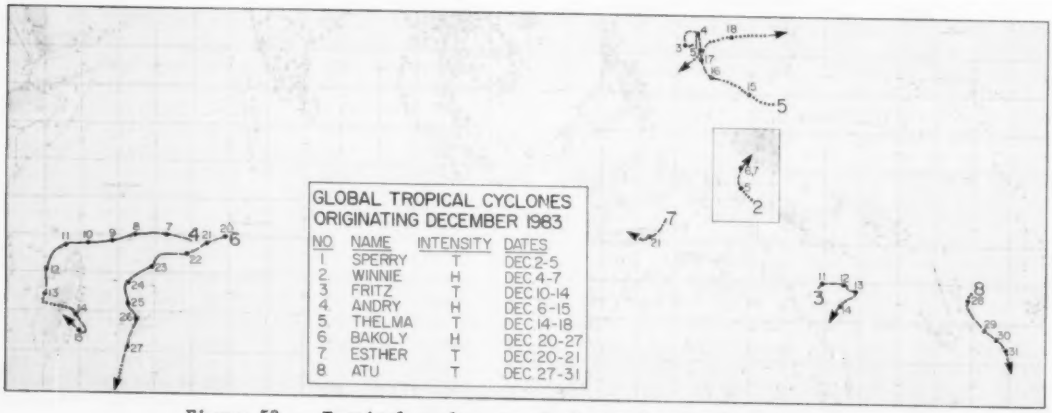
Lex, as he moved across the South China Sea, combined with the winter monsoon to generate gale force winds up to 300 mi north of his center. Early on the 25th Lex passed about 15 mi north of Xisha Dao where a 987-mb pressure was recorded. A few hours later Sanhu Dao reported 56-kn winds about 40 mi south of the storm center. During the night of the 25th Lex passed 35 mi off the coast of southern Hainan. A 6,000 ton oil drilling ship, the GLOMAR JAVA SEA, sank about 50 mi southwest of Hainan. All 81 crewmen including 42 Americans were missing. The 400-foot vessel was on lease to the Atlantic Richfield Company (See figures 41 and 42). On the morning of the 26th 46-kn sustained winds were recorded at Yulin some 100 mi east-northeast of Lex's center. Lex crossed the Vietnam coast some 190 mi south of Hanoi that afternoon. It was reported that 300 Vietnamese junks sank with more than 200 fishermen killed or missing.

Table 6.--Global tropical cyclone summary October, November, and December 1983

No.	Name	Ext. max. wind (kn)	Basin	Dates
		October 1983		
1.	28-83	50	N. Indian	1-4
2.	Herbert	50	Wrn. N. Pacific	7-9
3.	Ida	65	Wrn. N. Pacific	7-11
4.	Raymond	125	Ern. N. Pacific	8-20
5.	Joe	65	Wrn. N. Pacific	9-14
6.	Sonia	35	Ern. N. Pacific	11-14
7.	Tico	115	Ern. N. Pacific	11-19
8.	Kim	40	Wrn. N. Pacific	15-20
9.	Lex	70	Wrn. N. Pacific	22-26
10.	Marge	145	Wrn. N. Pacific	30-Nov 7
		November 1983		
1.	Velma	35	Ern. N. Pacific	1-3
2.	38-83	55	N. Indian	6-9
3.	Norris	50	Wrn. N. Pacific	7-11
4.	Pearl	35	Aust.-S. Pacific	13-14
5.	Orchid	125	Wrn. N. Pacific	16-27
6.	Percy	70	Wrn. N. Pacific	18-24
7.	Ruth	60	Wrn. N. Pacific	21-30
8.	45-83	45	S. Indian	22-25
9.	Quenton	70	Aust.-S. Pacific	28-30
		December 1983		
1.	Sperry	55	Wrn. N. Pacific	1-5
2.	Winnie	80	Ern. N. Pacific	4-7
3.	Fritz	45	Aust.-S. Pacific	10-14
4.	Andry	120	S. Indian	6-15
5.	Thelma	55	Wrn. N. Pacific	14-18
6.	Bakoly	90	S. Indian	20-27
7.	Ester	45	Aust.-S. Pacific	20-21
8.	Atu	45	Aust.-S. Pacific	27-31

Tropical storm Ida played havoc with shipping along the east coast of Japan from the 9th through the 11th. The dredger ZAHA NO. 3, ran aground, 500 mi northeast of Okahashima, capsized and sank in





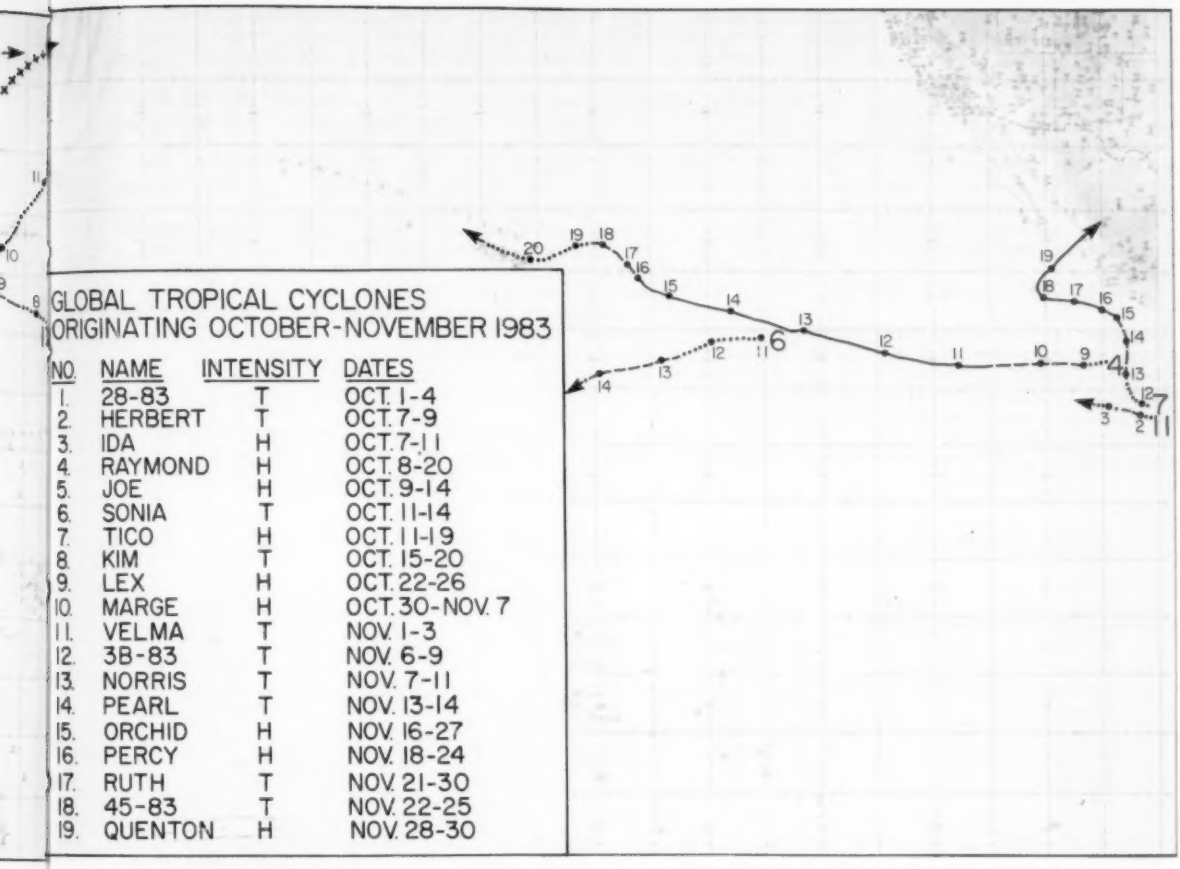
GLOBAL TROPICAL CYCLONES
ORIGINATING DECEMBER 1983

NO	NAME	INTENSITY	DATES
1	SPERRY	T	DEC 2-5
2	WINNIE	H	DEC 4-7
3	FRITZ	T	DEC 10-14
4	ANDRY	H	DEC 6-15
5	THELMA	T	DEC 14-18
6	BAKOLY	H	DEC 20-27
7	ESTHER	T	DEC 20-21
8	ATU	T	DEC 27-31

Figure 52.-- Tropical cyclone track charts for October, November, and December 1983.

strong winds. The ELKO MARU, laden with 1,500 tons of maize in bulk, collided with the TAIYO MARU and then voluntarily ran aground near Tsurisimahana Lighthouse to avoid sinking. The KYODO MARU, laden with 170 tons of roofing tiles, had cargo collapse due to heavy rolling resulting from large waves from the side and then suddenly sank. Two crewmen jumped overboard and were rescued by a passing vessel.

Bangkok experienced its worst monsoon flooding



GLOBAL TROPICAL CYCLONES
ORIGINATING OCTOBER-NOVEMBER 1983

NO.	NAME	INTENSITY	DATES
1.	28-83	T	OCT. 1-4
2.	HERBERT	T	OCT. 7-9
3.	IDA	H	OCT. 7-11
4.	RAYMOND	H	OCT. 8-20
5.	JOE	H	OCT. 9-14
6.	SONIA	T	OCT. 11-14
7.	TICO	H	OCT. 11-19
8.	KIM	T	OCT. 15-20
9.	LEX	H	OCT. 22-26
10.	MARGE	H	OCT. 30-NOV. 7
11.	VELMA	T	NOV. 1-3
12.	3B-83	T	NOV. 6-9
13.	NORRIS	T	NOV. 7-11
14.	PEARL	T	NOV. 13-14
15.	ORCHID	H	NOV. 16-27
16.	PERCY	H	NOV. 18-24
17.	RUTH	T	NOV. 21-30
18.	45-83	T	NOV. 22-25
19.	QUENTON	H	NOV. 28-30

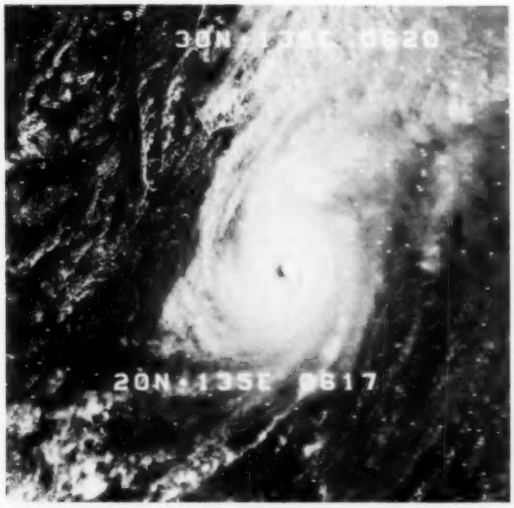


Figure 53.-- Hurricane Marge at 120 kn on November 6. Two days earlier she was up to 145 kn. NOAA.

in 30 years as 15.7 in of rain fell during the first 2 weeks of October. Tropical storms Herbert and Kim added to the rain and devastation when they struck provinces in northern and eastern Thailand causing at least 26 deaths and millions of dollars in damage. Some neighborhoods in Bangkok were under waist-deep water for nearly the entire month. Kim went on to cross into the North Indian Ocean where she reintensified causing 100 deaths in southern Bangladesh.

TROPICAL CYCLONES--NOVEMBER 1983

Some nine tropical cyclones developed this month with three reaching hurricane strength; this is slightly above average. In western Australia Cyclone Quenton arrived with wind gusts of more than 100-kn which damaged buildings in the settlement near the Wallal Downs cattle station some 28 mi west of Sandfire. Heavy rain caused flooding in Port Hedland and Broome. In the Philippine Sea typhoon Orchid generated winds up to 125-kn. The DAI LUNG began taking on water and her master decided to abandon ship in the rough waters in the South China Sea. A U.S. Navy helicopter which aided in the rescue, crushed landed and overturned on the frigate KIRK in the rough seas. The 169-ft

ferry DONA CASANDRA capsized in rough seas in the Surigao Strait, when the vessels cargo of lumber shifted. A total of 12 bodies had been recovered from the 387 passengers and crew. Most survived by reaching the small islands near the northeastern tip of Mindanao. On the Philippines one person was killed and thousands left homeless.

The JOTUN ran into trouble in typhoon Percy on the 20th. Her ships hatches were gone and she was listing and taking water. She reported hurricance force winds in zero visibility. No further messages were received as of the 23rd. The American yacht SEA LARK lost her rudder in the storm.

TROPICAL CYCLONES--DECEMBER 1983

December activity was above normal as eight tropical cyclones developed and three reached hurricane intensity. Normally six are reported of which two attain hurricane status. The eastern North Pacific's hurricane Winnie was the first December tropical cyclone since at least 1947. Two tropical storms also formed in the western North Pacific. The rest of the activity was confined to the normally more active Southern Hemisphere. Andry in the South Indian Ocean generated winds of 120-kn before barging ashore on Madegascar. Later in the month cyclone Bakoly mored through the Mascarene Islands. The storm struck Mauritius on Christmas Eve causing severe damage to electric and telephone circuits. The population was without water on Christmas Day. The SUGAR TRADER in Port Louis harbor was driven aground as moorings ported in 50 to 70-kn winds.

In the South Pacific, cyclone Atu developed on the 27th as one of three tropical storms to form east of 125°E this month. The nearest it came to making landfall was about 40 mi east of Eromanga Island where maximum sustained winds reached 30-kn. Maximum winds during the storm's life was estimated at 45-kn from GOES satellite imagery.[2]

TROPICAL CYCLONE WATCH, 1984

Table 7 indicates the tropical cyclones that have occurred thus for in 1984.

Table 7--Tropical Cyclone Watch, 1984

Australia-South Pacific				South Indian Ocean			
Tim	11S	T	Jan.	Domoina	13S	T	Jan.
Grace	12P	H	Jan.	Edoara	14S	T	Jan.
Beti	16P	H	Feb.	Vivienne	15S	H	Jan.
Harvey	17P	T	Feb.	Haja	19S	T	Feb.
Willy	18S	T	Feb.	Annette	20S	H	Feb.
Bobby	22S	H	Feb.	Imboa	21S	T	Feb.
Ingrid	23P	H	Feb.	Daryl	26S	H	Mar.
Chloe	24S	H	Feb.	Kamisy	30S	H	Apr.
Jim	25P	T	Mar.				
Cyril	27P	T	Mar.				
Kathy	28P	H	Mar.				
Lance	29P	T	Apr.				

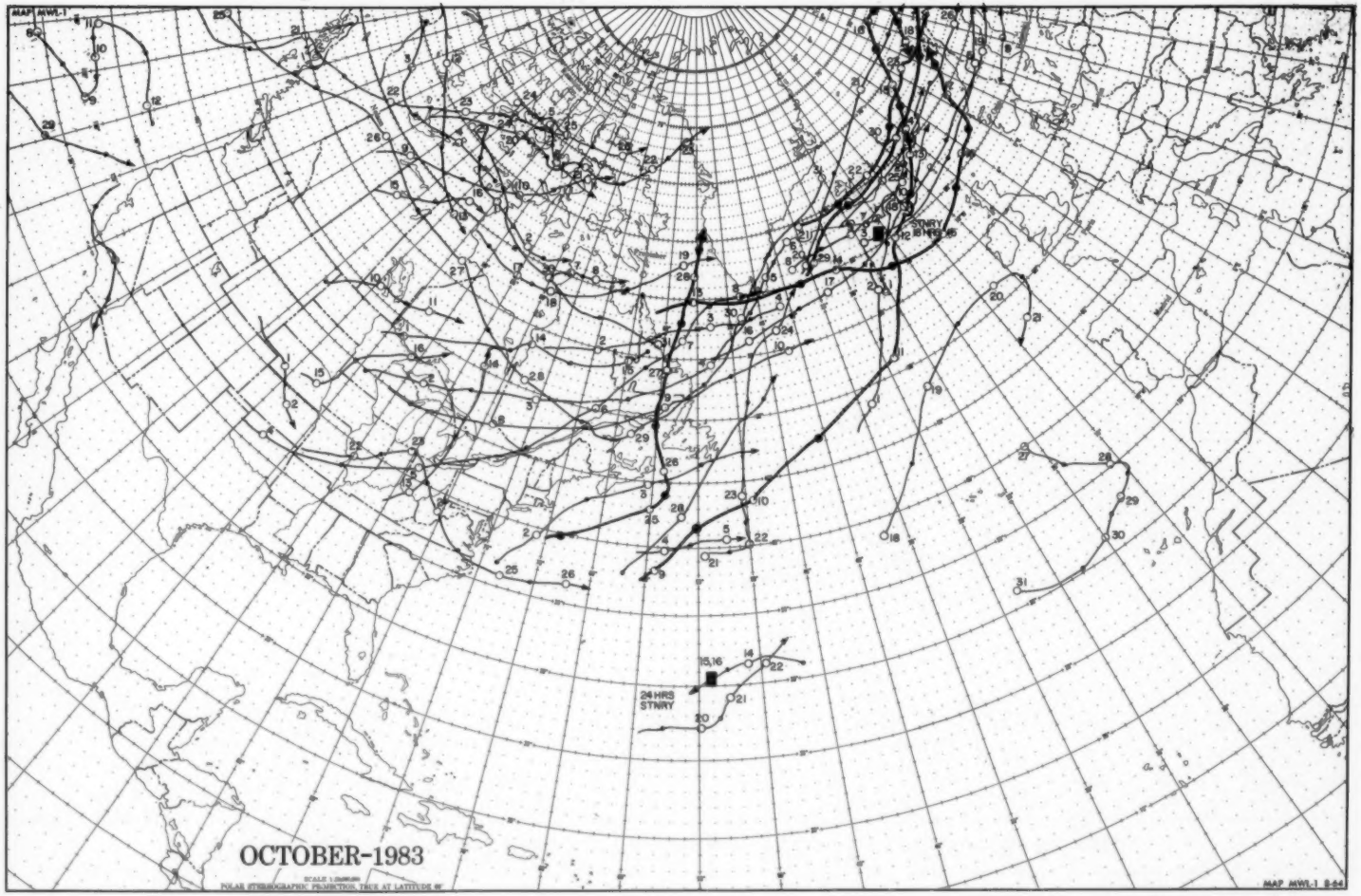
Continued from page 123.

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. 10°	Wind	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C Air	Temperature °C Sea	Sea Waves* Period sec.	Sea Waves* Height ft.	Swell Waves Dir. 10°	Swell Waves Period sec.*	Swell Waves Height ft.
	ATLANTIC	DEC.																
SEALAND VOYAGER	KHRK	22	44.0 N	47.5 W	12	32	N	50	1	NM	0994.7	3.2	1.0	6	8	32	6	13
TFL EXPRESS	9VPU	22	37.3 N	70.0 W	18	16	N	47	5	NM	07	1020.0	18.5	22.5	10	13	17	10	13
AMERICAN LEGACY	KFGJ	23	36.7 N	45.9 W	00	31		50	5	NM	16	1010.0	9.4	18.9					
SEALAND VOYAGER	KHRK	23	43.1 N	42.5 W	00	32	N	50	5	NM	81	0985.2	9.0	17.0	6	13	32	8	24.5
SEALAND LEADER	WSNH	23	36.5 N	43.6 W	00	32	N	50	5	NM	02	1004.5	12.5	18.0	4	13	32	10	41
LASH ATLANTICO	WEZU	23	35.7 N	22.7 W	06	20	N	45	5	NM	14	1001.0	17.8	17.2	6	8	21	6	26
AMCO VOYAGER	KADP	23	37.4 N	38.7 W	18	30		50	5	NM	81	1003.5	12.8	19.4	6	10	30	12	42.5
AMCO VOYAGER	KADP	24	37.4 N	39.3 W	00	31		45	10	NM	15	1010.0	11.7	20.0			31	15	39
LASH ATLANTICO	WEZU	24	34.0 N	28.0 W	06	30	N	55	10	NM	01	1006.1	15.0	18.3	6	8	29	6	24.5
T F L LIBERTY	9VDD	24	49.6 N	42.1 W	12	25	N	45	5	NM		0994.0	6.5	12.0	6	18	23	XX	10
NANCY LYKES	WCUU	24	30.9 N	31.3 W	12	31		45	10	NM	02	1018.8	20.0	21.1	5	10	31	9	16.5
	BLEM	24	35.3 N	58.0 W	18	22	N	58	2	NM	25	1002.0	19.0	19.0	6	24.5	20	6	23
SEALAND INDEPENDENCE	WGJC	25	53.8 N	23.0 W	11	24	N	45	10	NM	03	0997.0	9.0	10.0	5	13	26	8	11.5
T F L LIBERTY	9VDD	25	46.9 N	51.1 W	18	23	N	60	.5	NM	07	0973.0	3.5	2.7	9	26	23	9	24
AMCO VOYAGER	KADP	25	37.5 N	47.3 W	18	20		50	5	NM	07	1007.5	27.8	18.3	6	10	20	12	41
T F L LIBERTY	9VDD	26	46.7 N	51.8 W	00	25	N	45	10	NM	26	0992.0	- 0.5	4.0					
AMCO VOYAGER	KADP	26	37.4 N	48.1 W	06	19		50	5	NM	82	1006.0	27.8	21.1	3	6.5	19	10	39
AMERICAN RESOLUTE	KFDZ	26	41.4 N	39.1 W	12	20		45	5	NM	02	1018.2	17.2	15.4	6	11.5	22	14	18
AMERICAN RESOLUTE	KFDZ	27	41.1 N	40.5 W	00	22		45	.5	NM	81	1015.0	17.8	14.4	8	14.5	22	14	19.5
AMERICAN RESOLUTE	KFDZ	29	40.7 N	62.1 W	12	20		45	5	NM	02	1016.0	17.8	13.3	4	11.5	22	12	13
OVERSEAS ARCTIC	KLEZ	29	26.9 N	88.7 W	12	04		45	2	NM	62	1016.0	17.8	23.9	9	14.5	04	14	14.5
	GR. LAKES	DEC.																
GEORGE M HUMPHREY	WF7895	7	44.4 N	82.7 W	00	35	N	45	2	NM	86		- 2.4	11.0	6	8			
ELTON HOYT II	WE3993	15	47.8 N	88.0 W	06	04	N	46	10	NM	03		- 4.0	4.0	6	19.5			
GEORGE M HUMPHREY	WF7895	15	48.3 N	88.7 W	12	04	N	46	10	NM	02			7.0	6	8			
GEORGE A SLOAN	WA5307	22	42.5 N	87.1 W	18	26	N	56	.5	NM			-14.0	3.0	XX	10			
WALTER A. STERLING	WR3224	24	41.9 N	82.9 W	18	25	N	45	.5	NM	72			1.0	0	0			

+ Direction of sea waves same as wind
X Direction or period of waves indeterminate
N Measured wind

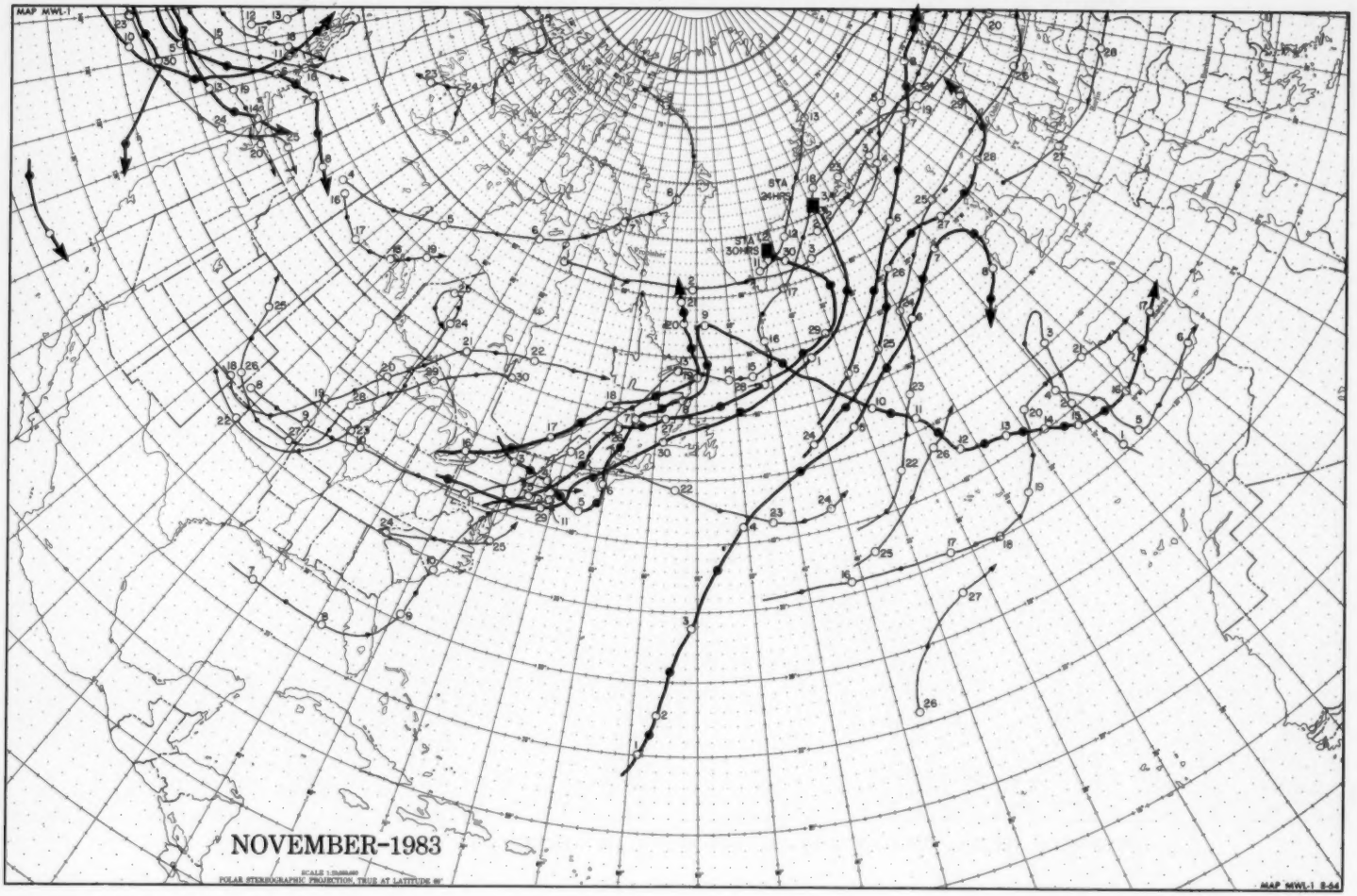
NOTE: The observations are selected from those with winds ≥ 40 kn or waves ≥ 20 ft from April through September and 45 kn or 30 ft October through March.

Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

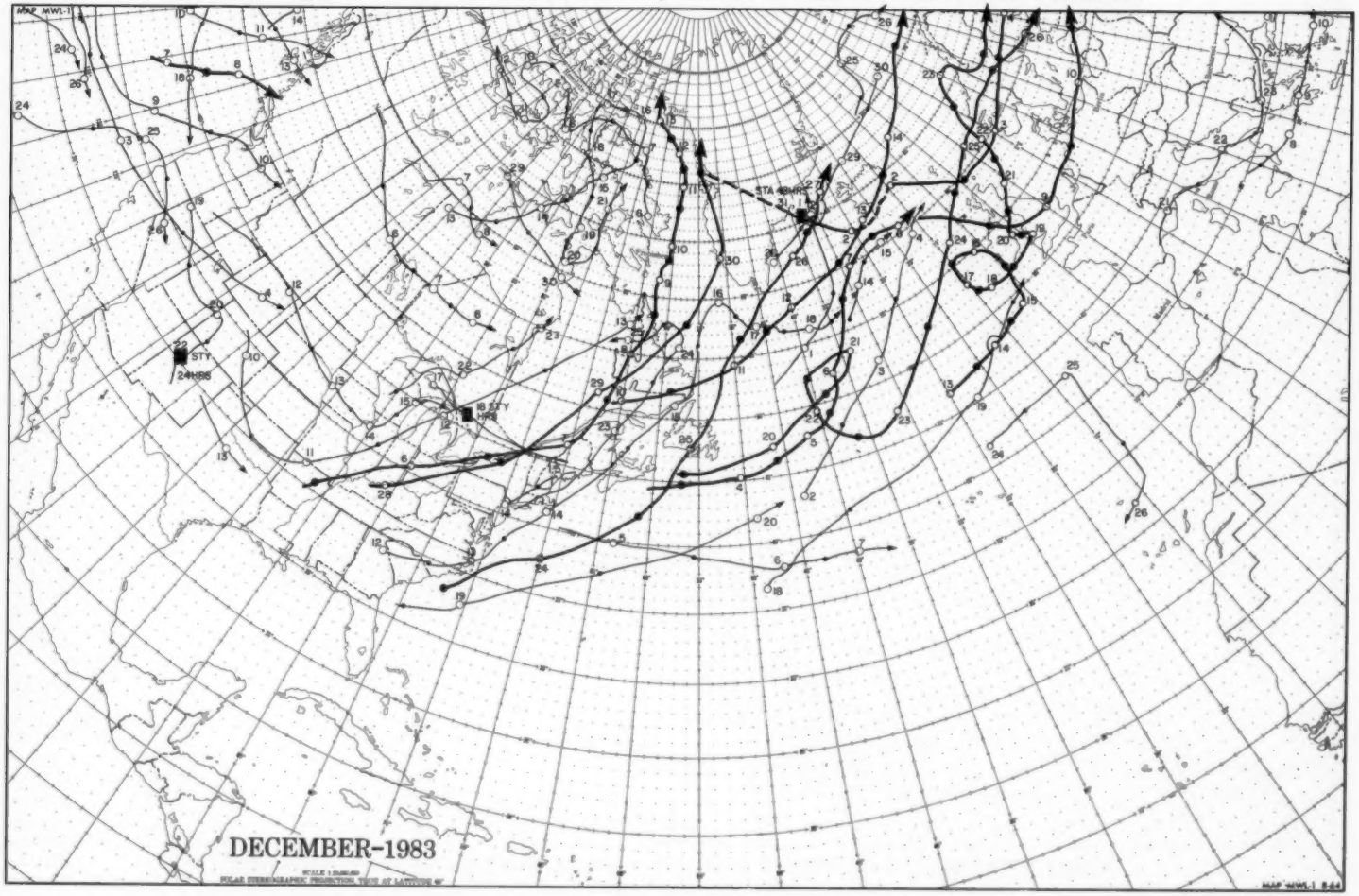
Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

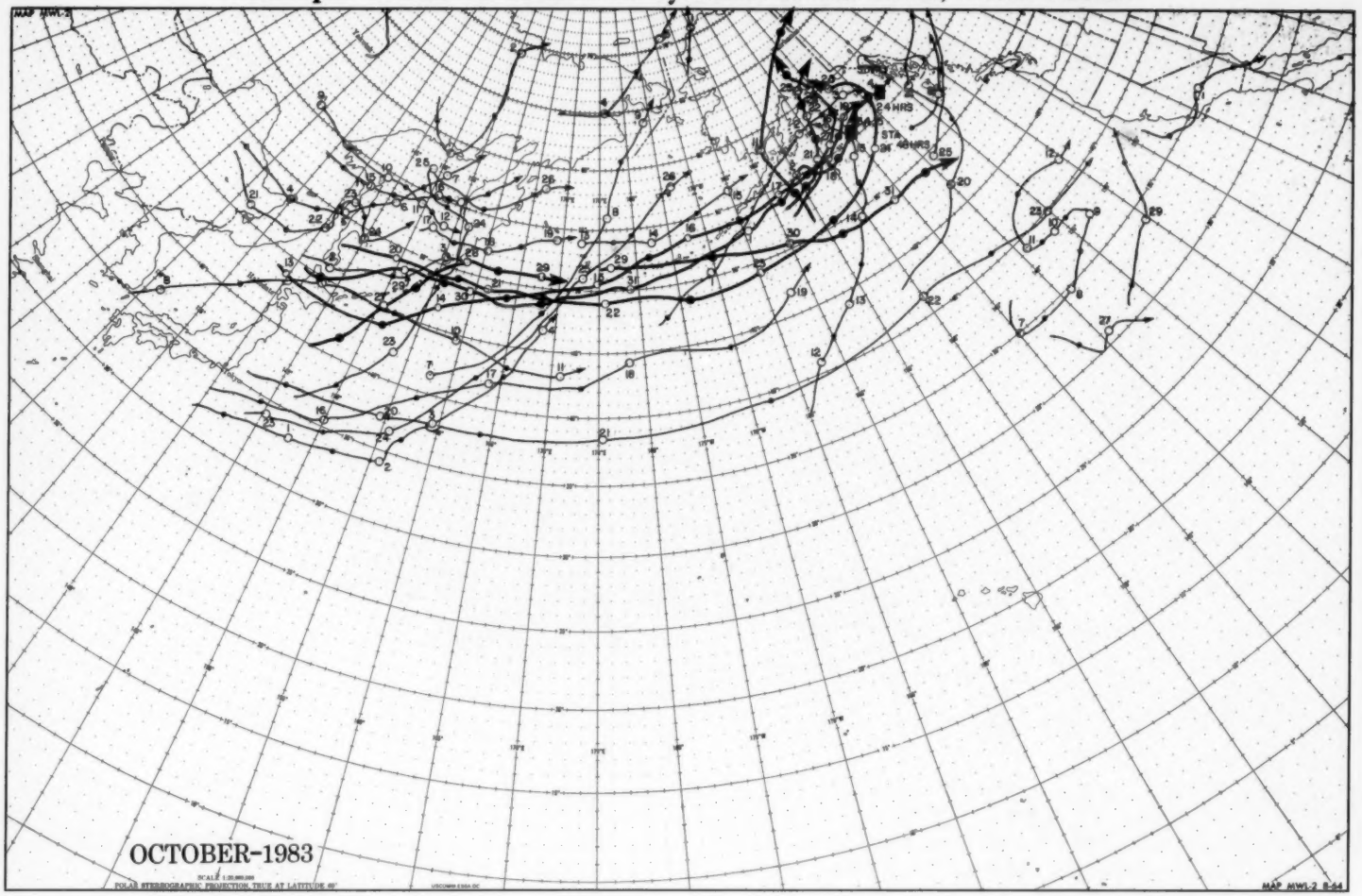
heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

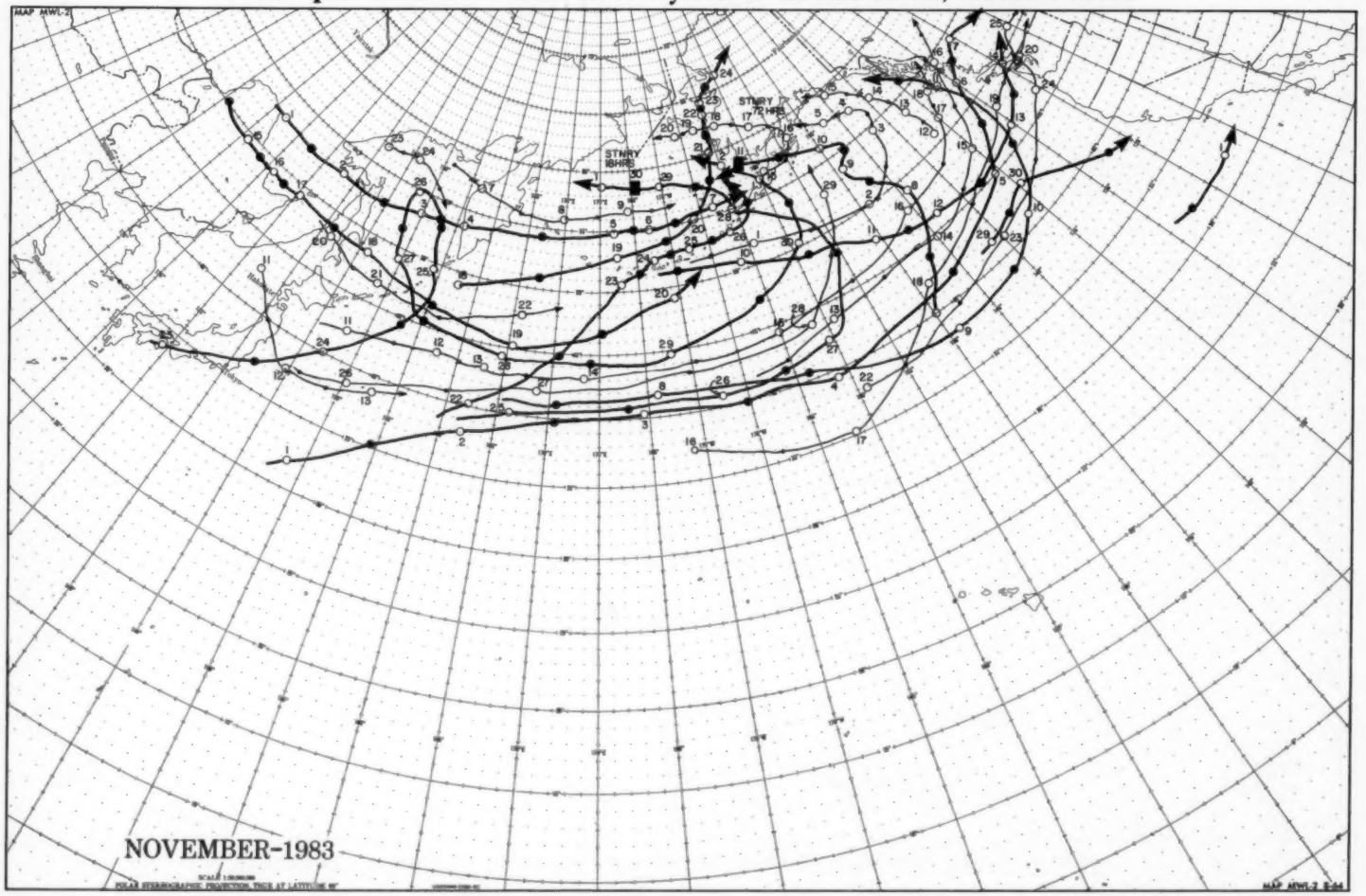
Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

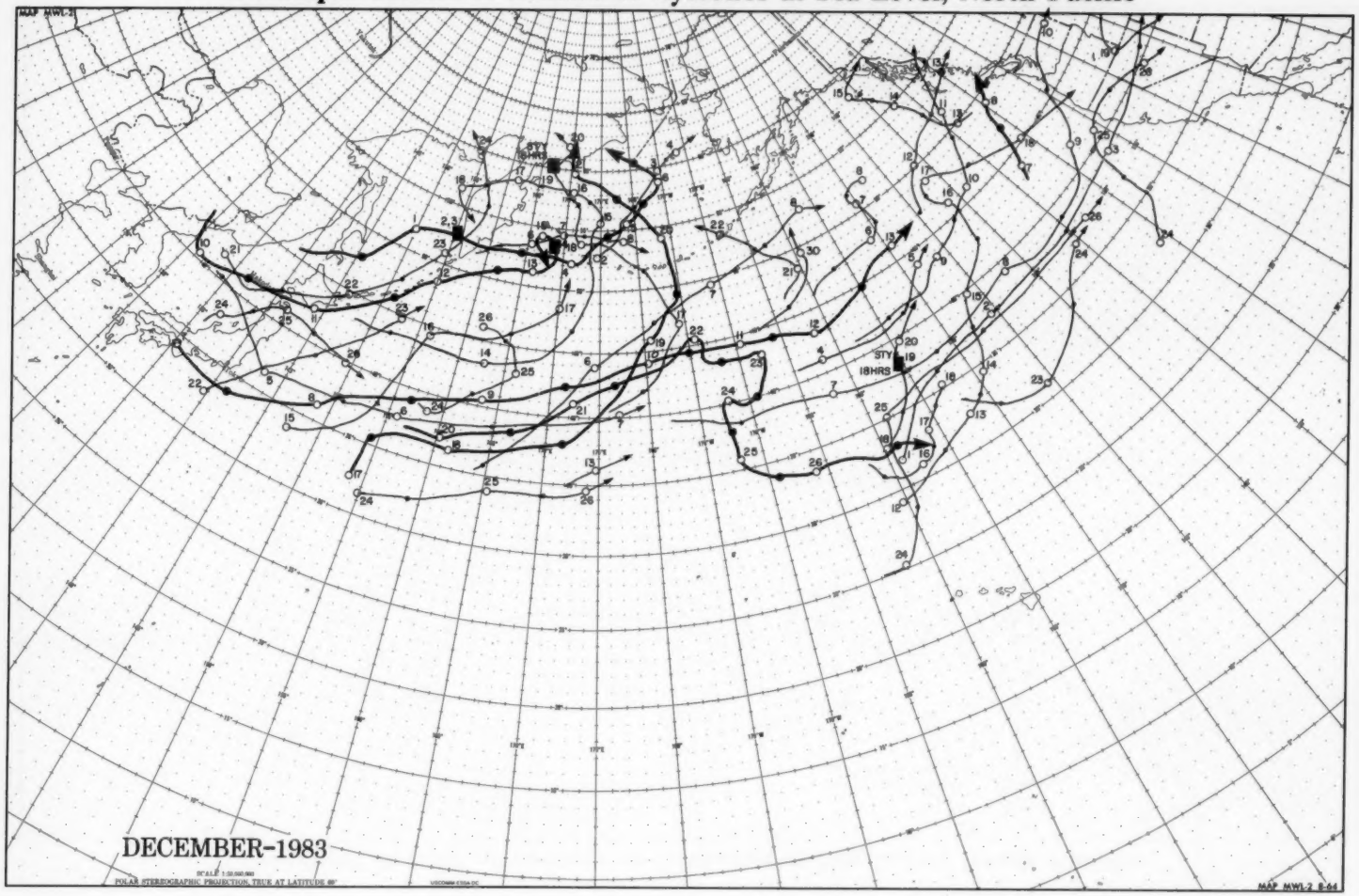
heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with a heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

North Atlantic Selected Gale and Wave Observations

October, November and December 1983

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. 10^{0}	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C. Air	Temperature °C. Sea	Sea Waves* Period sec.	Sea Waves* Height ft.	Swell Waves Dir. 10^{0}	Swell Waves Period sec.*	Swell Waves Height ft.
	ATLANTIC	OCT.															
AMERICAN EXPLORER	NTUS	6	58.1 N	37.9 W	18	26	45	5 NM	07	1000.2	3.2	4.3	15	29.5	31	20	29.5
SEALAND EXPRESS	KGJD	15	44.6 N	23.9 W	12	27	H 54	2 NM	57	1015.3	16.0	16.2	5	10	27	8	11.5
AMERICAN ARCHER	KFCS	23	46.4 N	55.0 W	16	24	45	40 NM	07	1004.0	8.3	12.2	10	23			
TFL ENTERPRISE	9VVD	25	44.6 N	57.2 W	18	28	H 64	.5 NM	59	0995.0	11.4	7.0	6	6.5	07	14	23
TFL DEMOCRACY	9VPR	25	45.0 N	58.4 W	22	32	H 56	2&3 YD	65	1003.5	11.2	11.7	13	26			
	ZGYC	29	25.4 N	47.1 W	17	34	16	5 NM	07	1016.2	25.0	25.9	9	3	30	6	29.5
	KNCX	29	54.6 N	16.7 W	18	32	47	5 NM	07	1028.0	11.7	12.2	6	23			
	KNCX	30	53.9 N	17.6 W	06	28	52	5 NM	07	1021.0	11.7	11.7	7	14.5	23	7	14.5
	GR. LAKES	OCT.															
BENSON FORD	WLR951	28	47.1 N	87.5 W	16	32	H 48	10 NM	29		8.4	8.8	9	10			
S T CHAPO	WDP2842	29	48.2 N	86.4 W	06	24	H 48	5 NM	01		8.2	7.8	5	8			
	ATLANTIC	NOV.															
FREDERICKSBURG	KNJN	2	30.5 N	72.0 W	00	07	30	10 NM		1022.7	22.2	26.7	7	11.5	07	10	29.5
AMERICAN ARCHER	KFCS	4	46.3 N	38.3 W	18	16	45	2 NM	16	1004.2	15.0	16.9	9	14.5	16	9	13
AMERICAN LEGEND	KFEY	5	48.4 N	39.5 W	18	32	55	1 NM	63	1000.0	9.5	14.5	8	41	32	8	41
SEALAND PIONEER	WSVB	5	48.8 N	27.8 W	18	19	H 45	1 NM	20	0993.2	15.0	14.0	15	23			
AMERICAN ARCHER	KFCS	6	47.5 N	29.0 W	00	22	45			0987.0	14.4	14.4	10	29.5	22	10	32.5
AMERICAN LEGEND	KFEY	6	48.2 N	40.2 W	06	33	47	2 NM	60	1018.0	11.0	17.7	8	37.5	33	8	23
KENNETH E HILL	DSOD	11	36.3 N	65.9 W	00	14	H 46	5 NM	60	1014.3	22.0		7	11.5			
AMERICAN ACCORD	KFEZ	11	42.5 N	38.2 W	17	30	48	5 NM		1003.8	14.0	17.8	10	31	30	10	31
AMERICAN LEGACY	KFGJ	11	43.2 N	36.5 W	18	31	45	2 NM	15	1002.8	13.9	18.3	6	8	32	11	16.5
AMERICAN ACCORD	KFEZ	12	40.4 N	36.3 W	00	31	42	10 NM	01	1012.0	13.3	17.8	9	29.5	29	10	29.5
TFL JEFFERSON	9VBS	12	45.5 N	40.8 W	06	31	H 26			1018.0	12.0		9	13	35	13	32.5
AMCO TRADER	KAAI	12	43.2 N	37.2 W	06	36	57	5 NM	25	1008.6	13.9	16.7	5	19.5	33	9	29.5
SAUDI RIYADH	HZBP	12	30.9 N	25.6 W	12	25	H 45	5 NM	00	1010.0	22.0	20.0	3	14.5	33	6	13
AMCO TRADER	KAAI	13	44.7 N	32.4 W	00	36	50	10 NM	01	1003.2	13.3	14.4	5	19.5	36	10	26
AMCO TRADER	KAAI	14	46.7 N	24.6 W	00	10	60	5 NM	00	0998.0	15.6	13.9	4	6.5	10	7	14.5
AMCO TRADER	KAAI	15	49.3 N	14.2 W	18	08	60	5 NM	02	1017.6	14.4	13.3	5	14.5	08	8	19.5
CHESAPEAKE	KNFE	16	35.3 N	73.2 W	12	28	48	5 NM	92	1004.9	21.7	24.0	8	13	29	10	14.5
AMCO VOYAGER	KADP	17	42.1 N	56.9 W	18	15	45	2 NM	07	1008.0	16.7	18.9	3	9	16	6	13
AMCO VOYAGER	KADP	18	41.3 N	63.2 W	18	29	45	10 NM	25	1004.0	8.3	17.8	3	5	25	7	18.5
AMCO VOYAGER	KADP	19	41.1 N	64.2 W	00	27	45	5 NM	25	1008.5	5.6	15.6	5	8	25	7	18.5
ASIA BRAVERY	ABCM	21	35.3 N	74.9 W	05	18	H 52	200 YD	62	1004.0	22.0	17.0	6	18	18	7	19.5
	KNCX	22	34.7 N	44.9 W	18	23	47	5 NM	18	1001.0	17.8	20.6	4	6.5	27	10	13
	KNCX	24	37.1 N	41.2 W	12	22	48	10 NM	03	0999.0	17.8	18.9	4	6.5	27	10	13
TONCI TOPIC	ELHX	24	42.7 N	47.2 W	18	33	45	5 NM	08	0999.0	13.0	19.0	5	16.5			
DISCOVERER SEVEN SEAS	3ELE	25	38.3 N	73.1 W	18	30	H 55	1 NM	07	1001.5	7.8	13.0	5	14.5	30	8	18
SEALAND PRODUCER	WJRJ	26	38.2 N	66.3 W	06	28	45	5 NM	01	1011.8	13.3	21.1	9	13			
MAUMEE	NSNF	26	46.5 N	08.5 W	17	22	45	2 NM	62	1009.8	16.7	14.7	6	13	23	10	29.5
9VDD	9VDD	26	50.2 N	30.0 W	18	31	H 52	2 NM	07	1004.0	6.0	14.0	8	14.5	31	13	18
AMCO TRADER	KAAI	26	48.8 N	08.7 W	18	22	45	.5 NM	10	0990.9		12.2	6	19.5	23	7	24.5
MAUMEE	NSNF	27	46.1 N	08.3 W	00	22	45	2 NM	62	0994.0	17.1	14.7	6	13	23	10	29.5
SEALAND PACER	KSLB	27	39.3 N	54.5 W	23	28	H 50	5 NM	01	0999.4	14.4	20.0	8	23	29	12	39
SEALAND PACER	KSLB	28	38.8 N	57.0 W	12	30	H 36	10 NM	80	1009.0	13.4	17.7	6	19.5	31	10	32.5
T F L LIBERTY	9VDD	29	47.1 N	49.9 W	00	32	H 52	5 NM	07	0995.5	3.0	4.5					
	BLEM	29	36.8 N	71.4 W	11	24	H 45	1 NM		1006.5	12.0	23.0					
	GR. LAKES	NOV.															
GEORGE A STINSON	WXP2336	11	45.2 N	82.1 W	06	05	H 49	10 NM	02		1.0	5.0	10	11.5			
ELTON HOYT II	WE3993	21	47.6 N	87.6 W	18	27	H 45	10 NM	03		9.0	4.0	3	14.5			
EDWARD R. GREENE	WE3123	24	46.6 N	86.5 W	06	20	H 46	5 NM	26		4.0	7.0	4	5			
ELTON HOYT II	WE3993	24	42.6 N	87.6 W	06	25	H 45	> 25 NM	02		2.0	8.0	6	10			
	ATLANTIC	DEC.															
DELAWARE II	KNBD	5	41.8 N	68.0 W	00	10	H 45	2 NM	63	1006.6	7.4	9.2	7	13	13	6	8
SEALAND ADVENTURER	KSLJ	5	38.5 N	65.6 W	18	28	H 50	10 NM	02	1004.5	17.0	23.0	5	13	28	9	13
TILLIE LYKES	WDOP	5	42.0 N	40.0 W	18	26	45	10 NM		0987.3	15.0	12.8	9	42.5	29	9	42.5
AMCO TRADER	KAAI	7	37.7 N	69.9 W	06	22	65	.5 NM	65	0995.2	21.7	21.7	7	32.5	20	6	26
SEALAND INDEPENDENCE	WGJC	7	40.5 N	70.7 W	12	27	H 51	5 NM	07	0993.0	13.0	11.0	6	19.5	25	8	19.5
TONCI TOPIC	ELHX	7	47.2 N	59.2 W	18	18	55			0985.0		6.0	6	26			
TFL EXPRESS	9VPU	9	49.5 N	07.3 W	12	30	H 55	5 NM	03	1004.0	12.0	13.0	9	18	29	10	19.5
TRANSCOLUMBIA	KPGQ	13	36.8 N	66.2 W	06	11	50	10 NM	02	1018.6	20.3	21.7	3	13	11	6	18
AMERICAN ARCHER	KFCS	14	47.0 N	10.0 W	00	21	45	5 NM	03	1010.0	12.8	12.2	10	24.5	21	10	24.5
TFL ENTERPRISE	9VVD	15	42.5 N	24.5 W	12	31	H 56	2 NM	61	1009.0	11.0	15.0	10	16.5	31	16	23
SEALAND PIONEER	WSVB	15	36.6 N	24.0 W	12	28	H 42	5 NM	61	1016.4	17.0	17.0	5	16.5	29	7	29.5
AMERICAN ARCHER	KFCS	15	42.6 N	20.5 W	18	32	40	4 NM	16	1001.0	10.0	15.0	10	29.5	32	10	29.5
AMERICAN ARCHER	KFCS	16	41.8 N	22.3 W	00	32	40	5 NM	16	1007.5	10.0	15.0	10	29.5	32	10	29.5
	BLEM	16	37.8 N	20.8 W	06	33	H 54	2 NM		1013.0	11.0						
SEALAND ADVENTURER	KSLJ	17	44.8 N	29.7 W	18	30	45	10 NM	02	0993.2	15.5	14.0	7	10	30	9	13
TFL JEFFERSON	9VBS	18	46.0 N	22.4 W	00	30	H 48	1 NM	50	0988.0	13.0						
SEALAND ADVENTURER	KSLJ	18	45.5 N	27.6 W	00	30	50	10 NM	01	0989.0	12.0	14.0	6	11.5	30	10	14.5
AMERICAN ARGOSY	KFCX	18	45.6 N	23.9 W	06	29	45	5 NM	27	0985.0	10.0	14.4	5	19.5	29	7	24.5
SEALAND INDEPENDENCE	WGJC	18	49.3 N	09.4 W	06	12	H 53	2 NM	61	0959.0	9.5	13.0	5	13	12	7	14.5
AMCO VOYAGER	KADP	18	45.4 N	22.6 W	18	28	50	5 NM	61	0984.8	10.0	16.7	3	8	28	8	24.5
AMERICAN ARCHER	KFCS	19	40.5 N	44.4 W	12	28	45	10 NM	01	1018.5	11.7	17.2	12	24.5	28	12	24.5
AMCO VOYAGER	KADP	19	42.9 N	25.0 W	18	27	50	10 NM	02	0994.2	11.1	17.2	3	6.5	27	8	32.5
SEALAND VENTURE	KLJH	20	48.4 N	37.2 W	00	31	40			0995.0	5.6	11.7	4	10	31	15	29.5
TILLIE LYKES	WDOP	20	50.4 N	03.2 W	12	20	55	5 NM		0974.0	11.1	10.0	5	19.5	20	8	23
	BLEM	20	37.1 N	43.2 W	18	20	H 50	1 NM	25	1006.0	17.0	19.0	7	24.5	23	7	24.5
AMCO TRADER	KAAI	20	47.4 N	23.7 W	18	28	45	4 NM	25	0990.5	10.4	12.2	2	10	28	12	24.5
AMCO VOYAGER	KADP	20	41.7 N	26.9 W	18	29	50	10 NM	03	1002.5	11.7	17.2	3	6	29	8	41
	KGYE	20	48.6 N	48.5 W	18	27	42	5 NM	86	0992.5	- 7.8	5.0	4	14.5	29	9	32.5
AMCO TRADER	KAAI	21	47.6 N	22.8 W	00	28	40	4 NM	18	0997.6	12.8	13.3	4	8	29	12	32.5
TFL FREEDOM	9VXX	21	48.6 N	20.6 W	18	27	H 53	2 NM		0984.2	12.0	13.0	6	29.5	27	8	36
	KGYE	21	46.0 N	55.8 W	18	33	42	1 NM	86	1005.3	- 5.0	2.8	4	13	32	8	29.5
	OWCY	22	39.0 N	57.6 W	00	30	47	5 NM	82	1020.0	6.5						
SEALAND LEADER	WSNM	22	37.1 N	51.8 W	00	30	H 50	2 NM	63	1013.6	10.4	20.0	3	13	31	6	19.5
AMERICAN LEGACY	KFGJ	22	38.8 N	51.7 W	06	30	56	5 NM	20	1017.2	6.7	20.2	8	26	28	7	23
AMERICAN RESOLUTE	KFDZ	22	51.4 N	14.0 W	12	27	60	10 NM	02	0988.9	8.3	12.2	5	10	27	14	19.5

Continued on page 116.

North Pacific Selected Gale and Wave Observations

October, November and December 1983

Vessel	Nationality	Date	Position of Ship		Time GMT	Wind			Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C		Sea Waves*		Swell Waves		
			Lat. deg.	Long. deg.		Dir. 10°		Speed kt.				Air	Sea	Period sec.	Height ft.	Dir. 10°	Period sec.*	Height ft.
	PACIFIC	OCT.																
EYSON LYKES	WSCJ	2	35.6 N	171.9 W	06	32		28	10	NM	01	1025.7	19.4	20.6	7	11.5	29	15	32.5
BARBARA FOSS	WYL4978	2	55.5 N	164.5 W	06	26	M	45	5	NM	21	1002.4	8.0	8.3	5	6.5	36	7	18
AMERICAN MERCHANT	KIRF	2	20.6 N	167.7 W	12	10		6M	10	NM	17	1013.0	24.4	26.7					
EXXON HOUSTON	KWLR	2	59.1 N	146.3 W	18	32	M	45	1	NM	61	0993.2	10.0	9.3	6	10	21	9	8
	KHFA	4	55.0 N	140.6 W	00	20		48	2	NM	52	1005.6	10.4	11.5	6	28			
SEA FAN	ELCG	6	40.6 N	160.6 E	05	15	M	37	.5	NM	81	1003.2	13.0	13.5	10	34.5	15	8	37.5
	WPET	6	41.6 N	167.1 W	23	24	M	51	.5	NM	18	1017.0	15.0	19.0	4	19.5	26	6	16.5
MUNRO WMEC 724	WGOF	7	40.5 N	141.6 E	04	24	M	20	25	NM	02	1006.3	6.7	15.0	8	5	27	11	41
SEALAND INNOVATOR	WGNF	7	51.3 N	149.6 W	12	24	M	45	10	NM	16	1023.8	9.0	10.0					
SEA FAN	ELCG	7	40.6 N	173.3 E	23	17	M	25	.5	NM	45	1008.5	11.0	12.0	7	28	17	6	29.5
CLIFFORD MAERSK	OXZN	16	39.5 N	136.2 W	00	34		52	1	NM	07	1003.0	15.6		10	19.5	04	10	19.5
SURVEYOR	WTFS	11	57.3 N	148.5 W	14	32	M	52	5	NM	01	1009.1	9.0	9.0	9	11.5	22	12	21
CHEVRON CALIFORNIA	WGDN	12	50.6 N	147.1 W	04	23		57	10	NM	07	1019.3	10.0	9.4	5	16.5	22	6	32.5
STAR DOVER	H9AU	13	52.9 N	176.6 E	12	34		47	2	NM	91	0971.0	8.0						
ARCTIC TOKYO	SLJT	13	54.3 N	170.2 W	18	14	M	45	2	NM	25	1000.0	7.0	8.0	5	16.5			
PRESIDENT GRANT	WEZD	15	42.3 N	160.4 E	16	34	M	35	10	NM	02	1022.4	9.4	11.7	2	3	32	12	32.5
GLACIER BAY	KACF	16	57.4 N	179.8 W	08	29		45	2	NM	67	1003.0	8.5	6.5	5	16.5	11	8	24.5
	3EOR	17	34.2 N	154.7 E	04	25	M	48	10	NM	07	1006.0	25.0	24.0	6	13	12	7	11.5
PACMERCHANT	5MCN	18	40.6 N	168.3 E	04	24	M	57	1	NM	11	0999.0	5.0	10.0	4	10	08	8	16.5
SS P T SAN DIEGO	WSVR	18	48.6 N	132.7 W	12	18		48	2	NM	58	1003.4	12.8	13.9					
EASTERN PACIFIC	H9XW	21	54.2 N	164.2 W	04	24	M	48	10	NM	02	0991.0	3.0	8.0	6	14.5	32	7	21
	3ZZO	21	56.9 N	158.7 W	12	31	M	48	10	NM	02	0992.4	4.0	9.0					
	JJSO	21	47.0 N	160.6 E	14	24	M	45	1	NM	82	0994.5	7.0	9.0	2	6.5	24	5	13
SEALAND FREEDOM	WGJA	21	54.7 N	150.4 W	14	26	M	57	5	NM	02	0983.2	8.0	11.0	13	14.5	28	15	19.5
EXXON NEW ORLEANS	WNDM	24	50.2 N	140.7 W	00	19		45	10	NM	02	0978.2	13.3	14.0	5	6.5	18	7	11.5
GLACIER BAY	KACF	23	57.3 N	139.9 W	04	32		35	10	NM	26	0995.6	6.0	8.8	4	11.5	24	12	29.5
SEALAND PATRIOT	KHPF	24	45.0 N	161.8 W	04	27	M	32	10	NM	01	1010.0	12.0	8.0	8	13	28	8	32.5
VAN CONQUEROR	AGIB	24	5.9 N	143.3 W	12	27	M	48	5	NM	57	0982.2	8.0	13.0					
NEPTUNE JADE	5QCT	24	50.1 N	129.9 W	12	26	M	56	.25	NM		1008.3	11.5						
GALVESTON	KGGA	24	5.3 N	128.7 W	14	19		50	2	NM	07	1001.2	11.7	12.3	13	29.5	19	10	29.5
	3EUS	25	48.1 N	191.9 W	04	25	M	33	10	NM	07	1007.0	13.0	13.0	9	29.5	25	9	32.5
MEONIA	OXCN	25	47.1 N	135.6 W	04	33	M	36	5	NM		1009.5	13.4		10	32.5			
SS P T SAN DIEGO	WSVR	25	58.4 N	140.5 W	12	23		56	5	NM	51	0993.0	6.1	8.3					
SEALIFT MEDITERRANEAN	WMMT	27	51.9 N	176.3 W	16	18		45	1	NM	81	1001.0	9.4	8.9	4	8	18	5	13
ARCO JUNEAU	KSBS	27	52.5 N	137.5 W	24	28	M	50	2	NM	64	0993.0	8.9	11.1	11	24.8	28	11	29.5
PORTLAND	WADF	28	53.3 N	174.6 W	04	24	M	50	2	NM	63	0999.0	9.2	7.8	4	10	20	8	19.5
SEALAND LIBERATOR	KHRP	28	40.5 N	156.4 E	08	23		57	2	NM	62	0978.3	6.3	7.0	8	24.5	23	10	29.5
G T ALASKA	WFOE	28	53.9 N	140.6 W	08	24	M	48	5	NM	01	0986.9	7.0	9.4	5	14.5	17	10	16.5
SEALAND LIBERATOR	KHRP	29	43.2 N	171.6 E	16	24		47	5	NM		0998.8	8.2	6.1	6	10	30	10	23
ARCTIC TOKYO	SLJT	30	5.5 N	160.5 E	06	13	M	58	2	NM	25	0984.0	9.3	8.2	12	19.5			
PRESIDENT LINCOLN	KUBS	31	51.6 N	159.4 E	04	23	M	45	2	NM	52	0991.5	3.9	6.1	10	16.5	04	12	19.5
CHARLOTTE MAERSK	OYIU	31	47.6 N	156.0 W	06	26		50				1004.0	9.0		4	16.5	32	8	19.5
	6ZKS	31	45.3 N	166.6 E	14	27	M	41	2	NM	10	0999.0	7.0	8.0	8	13	27	15	29.5
ADRIAN MAERSK	OYIT	31	40.6 N	175.2 W	16	24		45	5	NM		0989.0	10.4		10	23			
	PACIFIC	NOV.																	
MOBIL ARCTIC	KSPY	1	54.5 N	139.3 W	12	09		50	2	NM	81	0987.3	9.9	8.9	6	14.5			
GALVESTON	KBGA	1	56.0 N	140.0 W	18	09		47	5	NM	02	0993.0	7.8	8.3	6	8	09	8	10
	DDKX	2	41.5 N	161.8 E	00	27		48	2	NM		0998.5	13.1	13.6	8	13	29	20	23
SEA FAN	ELCG3	3	35.2 N	171.7 E	05	23	M	26	2	NM	65	1005.0	21.0	20.0	12	34.5	23	10	37.5
MOHSING BREEZE	3EOU	3	35.0 N	176.5 E	12	23		45				1004.5	21.0	22.5	10	19.5	23	9	16.5
	WDLP	3	20.1 N	175.6 E	18	13		27	5	NM	25	1018.6	25.0	26.7	1	3	32	10	55.5
G T ALASKA	WFOE	4	55.0 N	137.0 W	00	18		44	1	NM	64	0976.0	9.4	8.9	6	16.5	19	12	32.5
BARBARA FOSS	WYL4978	4	57.0 N	136.4 W	06	14	M	45	5	NM	81	0981.0	10.0		0	11.5	14	0	11.5
YOCONA WMEC 168	WNHB	4	51.1 N	154.4 W	12	30	N	29	5	NM	18	1001.0	4.0	9.0	5	6.5	32	15	36
CHEVRON OREGON	WNHL	4	52.5 N	137.8 W	18	22	M	33	5	NM	84	0997.9	5.5		4	6.5	24	8	29.5
PRESIDENT GRANT	WEZO	5	49.4 N	156.1 E	00	31	M	55	10	NM	02	1002.2	4.4	6.7	3	6.5	30	7	16.5
CHEVRON OREGON	WNHL	5	53.6 N	138.7 W	00	20	M	28	10	NM	24	0996.2	4.4		4	6.5	24	8	29.5
LEXA MAERSK	OXFB	5	49.7 N	160.6 E	06	29		48	2	NM	26	0994.0	3.0		12	23	24	10	19.5
ARCO ANCHORAGE	WCIO	5	50.0 N	128.9 W	22	13	M	58	.25	NM	45	0980.0	8.3	11.7	3	11.5	14	4	14.5
GALVESTON	KBGA	6	51.1 N	129.9 W	00	11		65	1	NM		0979.0	8.9	12.3	5	10	11	12	32.5
CORNUCOPIA	KPJC	6	49.0 N	135.0 W	18	30		45	5	NM		1005.8	8.3	10.6	8	11.5	30	12	26
SEA FAN	ELCG3	6	33.8 N	150.6 E	23	16	M	12	5	NM	02	0996.0	24.5	21.0	6	23	16	9	29.5
HOEGH MIRANDA	LIQZ	7	36.3 N	145.0 E	06	04	M	46	2	NM	63	1005.5	15.0	22.6	5	14.5			
MOHSING BREEZE	3EOU	7	36.3 N	153.5 E	12	05		50	200	YD	80	0996.5	17.0	23.0	12	19.5	05	14	18
BARBER TAIF	LIPD	8	39.1 N	139.7 W	00	14		45	1	NM	07	1006.0	14.5	15.0	XX	16.5	17	XX	16.5
QUATSINO SOUND	ELAW3	8	51.2 N	133.6 W	18	11	M	47	5	NM		1001.6	10.0		5	19.5			
EXXON NEW ORLEANS	WNDM	8	46.2 N	131.4 W	18	14	M	55	2	NM	63	0998.9	11.1	12.2	5	13	17	5	8
PACGLORY	5LZB	9	49.5 N	132.5 W	00	14		45	2	NM	51	0990.1	10.0	13.0	12	19.5	14	13	19.5
GREEN STAR	JPND	9	55.4 N	146.5 W	00	09	M	49	200	YD	63	0980.0	9.0	8.5	5	10	09	9	19.5
BARBARA FOSS	WYL4978	9	59.1 N	151.3 W	06	09	M	52	10	NM		0994.0	7.0	8.0	0	16.5	09	0	16.5
NEWARK	WNDO	9	57.6 N	145.8 W	12	09		40	5	NM	02	0985.9	7.2	7.8	XX	19.5	09	14	36
SOCONY VACUUM	KIGL	9	33.2 N	136.2 E	18	04		45	10	NM	02	1016.6	18.3	24.4	8	11.5	04	9	13
TONSONIA	KJDG	9	58.3 N	154.0 W	18	16		15	8	NM		0988.0	12.0	13.0	3	6.5	14	10	32.5
ARCO ANCHORAGE	WCIO	9	59.0 N	142.9 W	20	12	M	45	5	NM	03	0988.5	8.3	7.8	3	16.5	12	3	18
	6ZKS	10	40.2 N	136.6 W	06	12	M	60					17.0	14.0	5	16.5	12	7	14.5
	BHFK	10	38.2 N	136.9 W	06	26	M	45	.5	NM	59			15.0					
EXXON NEW ORLEANS	WNDM	10	40.2 N	125.5 W	15	18	M	60	2	NM	63	0988.3	17.0	15.0	10	32.5			
WESTWARD VENTURE	KHJB	10	49.4 N	127.3 W	18	12	M	45	5	NM		0978.0	12.2	10.5	6	13	12	9	32.5
TONSONIA	KJDG	10	56.8 N	142.3 W	18	15		45	5	NM		0993.0	8.3	7.2	7	10	15	12	16.5
MOKU PAHU	WBWK	10	34.0 N	130.5 W	18	24		25	5	NM	03	1002.5	17.8	20.6	3	6.5	24	8	29.5
CHEVRON COLORADO	KLHZ	11	41.7 N	126.7 W	00	21	M	26	5	NM	01	0992.0	14.4		3	10	24	10	29.5
MOKU PAHU	WBWK	11	32.8 N	132.3 W	06	24		15	10	NM		1010.5	17.2	20.6	3	6.5	27	12	32.5
	WGJF	11	41.5 N	156.0 W	06	29	M	47	10	NM	01	0996.0	10.0	9.0	8	19.5	XX	8	19.5
S.S. MOBIL MERIDIAN	KGSM	11	50.3 N	129.7 W	12	19		50	5	NM	07	0976.2	9.4	11.7	6	14.5	13	4	19.5
PRESIDENT MONROE	WNRD	11	53.2 N	173.3 E	12	27	M	45	5	NM	94	0992.0	2.2	4.4					

Vessel	Nationality	Date	Position of Ship		Time GMT	Wind		Visibility n. mi.	Present Weather code	Pressure mb.	Temperature °C		Sea Waves*		Swell Waves		
			Lat. deg.	Long. deg.		Dir. 10°	Speed kt.				Air	Sea	Period sec.	Height ft.	Dir. 10°	Period sec.*	Height ft.
	PACIFIC	NOV.															
	K6JX	12	40.0 N	149.5 E	00	29	M 51	5 NM	10	0993.2	14.4	14.0	9	32.5			
JUNO	SMZH	12	46.4 N	165.5 E	05	09	M 47	10 NM	24	1001.0	5.0	10.0	4	13	09	4	13
SACRAMENTO	H3DR	12	45.0 N	160.5 E	06	08	M 47	.25 NM	81	0990.0	7.0	8.0	11	16.5	08	10	18
CHARLOTTE MAERSK	OYIU	12	38.4 N	153.4 E	06	27	45	10 NM	02	0999.0	16.4		3	10	27	8	19.5
DRAGOR MAERSK	OWYZ	12	37.1 N	160.0 E	12	26	46			1003.0	21.8	19.0					
	W6JF	12	40.8 N	158.8 W	12	30	M 55	5 NM	01	1005.5	12.0	10.0	8	19.5	XX	8	19.5
GALVESTON	KBGA	12	52.6 N	132.3 W	18	15	52	10 NM	18	0983.0	10.0	10.0	4	13	15	8	14.5
PRESIDENT PIERCE	WUBV	12	45.6 N	175.1 E	18	09	48	5 NM	60	0995.7	5.6	5.6	8	13			
CORNUCOPIA	KPJC	13	45.5 N	127.5 W	12	21	45	5 NM		0981.5	10.0	12.8	6	16.5	23	8	14.5
GALLEON DIGNITY	DZR6	13	44.4 N	153.5 W	18	09	M 46	2 NM	63	0987.0	8.0	14.0	5	8	09	5	8
HOTAKA MARU	JCZF	13	40.0 N	156.4 W	18	24	M 46			0989.8	14.5	14.5	3	8	24	9	19.5
LEISE MAERSK	OXDW	13	46.1 N	130.6 W	18	31	45	10 NM	81	0989.0	11.5		7	23			
BOGASARI DUA	PLYA	13	44.1 N	128.6 W	18	27	M 60	5 NM	01	0999.2	13.0	14.0	14	32.5	26	18	29.5
AMERICAN LIBERTY	WZJD	13	35.7 N	127.3 W	18	27	33	10 NM	25	1017.0	16.7	14.0	8	8	30	14	29.5
GALLEON DIGNITY	DZR6	14	44.3 N	151.1 W	00	07	M 48	2 NM	81	0981.5	8.7	14.0	5	8	13	5	11.5
CORNUCOPIA	KPJC	14	48.1 N	129.1 W	00	30	50	5 NM	50	0991.0	10.0	11.6	6	13	29	6	11.5
WECOMA	KRSF	14	32.4 N	122.1 W	00	25	M 12	10 NM	01	1021.2	17.8	17.8	1	1.5	30	12	32.5
DRAGOR MAERSK	OYYZ	14	34.6 N	147.1 E	00	30	45	10 NM	01	1010.8	23.8	20.0			30	6	10
SOCONY VACUUM	KIGL	14	37.5 N	146.1 E	06	35	55	10 NM	02	1011.9	16.3	22.8	8	13	29	10	14.5
BOGASARI DUA	PLYA	14	41.9 N	131.9 W	18	20	M 52	1 NM		1005.0	17.0	14.0	9	29.5	22	12	31
KEYSTONER	KIGR	15	45.5 N	124.3 W	00	17	55	2 NM	59	1008.8	12.8	13.9	7	13	20	12	14.5
BOGASARI DUA	PLYA	15	41.4 N	132.9 W	00	20	M 50	1 NM	10	1000.2	15.0	14.0	9	29.5	21	12	31
SEALAND DEFENDER	KGJB	15	42.1 N	159.3 W	18	25	M 45	5 NM		0986.5	12.5	13.0	3	8	25	8	14.5
	BICO	16	40.8 N	151.6 W	04	28	M 45			0993.0	13.0	11.0	4	16.5	28	7	21
KEYSTONER	KIGR	16	43.5 N	124.7 W	06	18	45	5 NM	60	1001.0	13.3		6	8	18	9	11.5
CANAL ACE	3FCI	17	43.5 N	137.9 W	00	24	M 54	1 NM	81	0988.5	7.5	14.0	9	8	27	12	46
	SLOT	17	52.4 N	138.0 W	17	33	M 45			0996.0	10.0	11.0	6	19.5	33	8	24.5
CHEVRON COLORADO	KLHZ	17	50.8 N	135.6 W	18	32	M 49	2 NM	21	0985.2	7.2		6	8	32	5	14.5
SIENA	OXFU	17	38.6 N	163.2 W	18	02	M 45	700 YD	63	1000.8	13.0	16.0	6	13			
GLACIER BAY	KACF	18	45.0 N	127.7 W	00	27	36	10 NM	15	1001.0	13.0	11.5	3	10	27	12	39
SEALAND INNOVATOR	WGKF	18	49.5 N	132.5 W	00	29	M 35	2 NM	81	0991.0	11.0	11.0	4	13	22	8	29.5
OVERSEAS JUNEAU	WWMD	18	53.1 N	138.0 W	00	31	45	2 NM	63	0989.5	7.8	8.3	6	23	30	8	26
	ZCUT	18	34.3 W	142.6 E	00	27	47	5 NM		1008.7	15.0	22.0	7	16.5	27	7	19.5
PRESIDENT TYLER	WEZM	18	50.7 N	157.9 E	12	05	M 50	2 NM	84	0998.3	0.6	3.9	6	8	03	9	26
KOREAN WONIS ONE	D7XX	18	34.3 N	126.7 W	18	35	10	5 NM	03	1027.0	18.0	19.5	4	8	35	30	49
	WGJF	18	35.8 N	144.1 E	18	29	M 47	10 NM		1009.5	15.0	20.0	9	16.5	27	10	19.5
EASTERN DIAMOND	HODT	19	39.6 N	145.2 E	00	31	M 44	1 NM		1001.0	9.0	8.0	10	29.5	32	17	14.5
	BICC	19	40.9 N	175.5 E	06	22	M 62			0991.6	14.0	16.0	10	37.5	21	10	37.5
	ELKN	19	36.5 N	156.5 E	12	28	M 46	1 NM	21	1006.5	14.0	16.0	12	21	28	13	21
CLIFFORD MAERSK	OXZN	19	38.9 N	179.2 E	12	18	50			1000.5	16.5		7	19.5			
ARCTIC TOKYO	SLJT	19	52.5 N	175.4 E	18	08	M 45	1 NM	65	0973.0	2.0	6.0	8	8			
	9VHM	19	44.8 N	128.1 W	18	27	M 59	.5 NM	61	0996.5	12.0	9.5	14	23	26	16	23
PRESIDENT TYLER	WEZM	19	43.4 N	147.5 E	18	32	M 45	10 NM	02	1015.0	2.8	3.9	7	19.5	32	9	19.5
PRESIDENT JEFFERSON	WPGE	19	40.3 N	176.3 W	19	19	M 65	.5 NM	64	0996.0	16.1	11.1	9	21	19	11	24.5
SEALAND DEVELOPER	KHRH	19	54.0 N	178.5 E	21	05	M 51	2 NM		0975.8	1.0	4.0	7	14.5	09	14	19.5
	9VHM	20	44.5 N	128.3 W	00	28	M 45	2 NM		1001.5	12.5		12	21	26	16	23
	DDKX	20	52.6 N	169.0 E	00	04	52	.5 NM	26	0987.5	1.2	2.6	9	18	05	13	19.5
SEALAND DEVELOPER	KHRH	20	53.7 N	177.3 E	00	05	M 47	2 NM	07	0975.0	3.0	4.0	7	16.5	09	12	19.5
SOCONY VACUUM	KIGL	20	48.2 N	171.2 W	00	19	55	2 NM	62	0978.7	9.4	4.4	7	18	19	8	34.5
	HPAU	20	33.0 N	172.5 E	06	29	M 29			1008.0	22.0	23.0	7	19.5	29	7	29.5
ALEUTIAN DEVELOPER	WIPL	20	55.5 N	159.5 W	06	12	50	5 NM		0997.8	2.2	7.2	4	8	15	6	13
PRESIDENT JEFFERSON	WPGE	20	40.6 N	171.1 W	12	19	M 40			0994.5	14.4	12.8	8	32.5	19	10	32.5
MING GALAXY	BLHW	20	35.4 N	125.0 E	17	31	M 50			1013.5	13.5	17.0	10	23	33	10	16.5
	BICC	21	41.1 N	172.0 W	00	24	M 28			0998.0	14.5		6	6.5	26	31	49
WESTWARD VENTURE	KMJB	21	57.5 N	145.7 W	00	17	M 47	5 NM		1014.3	5.0	7.2	8	8	24	6	10
SOCONY VACUUM	KIGL	21	46.3 N	166.5 W	12	23	35	10 NM	03	0993.6	7.8	6.2	8	16.5	25	8	29.5
SS B T SAN DIEGO	WSVR	21	44.2 N	128.6 W	12	33	48	10 NM	02	1013.0	10.0	10.0					
OVERSEAS JUNEAU	WWMD	22	57.9 N	142.3 W	00	16	40	5 NM		0994.0	7.2	6.7	4	16.5	17	10	32.5
VAN CONQUEROR	A8IB	22	40.8 N	168.2 E	18	19	M 55	1 NM	64	0987.0	9.0	12.0					
CLIFFORD MAERSK	OXZN	22	35.9 N	162.7 E	18	30	48	2 NM	82	0999.0	16.0						
AMERICAN LYNX	WZJE	23	34.9 N	171.9 E	00	18	40			1002.0	20.0	18.3	12	13	18	12	29.5
	ZCUT	23	36.5 N	173.1 E	00	18	56	.5 NM	80	0997.7	17.1	17.0	12	29.5	18	12	29.5
	3EDR	23	34.0 N	170.3 E	12	30	M 47	2 NM	25	1011.5	15.0	23.0	5	19.5	27	5	16.5
BARBER TOPA	LHOE	23	38.0 N	178.1 W	12	18	M 55			1009.5	17.0		8	18			
CANAL ACE	3FCI	23	54.7 N	174.4 W	16	11	M 47	1 NM	66	0987.5	0.0	7.0	4	18	11	7	19.5
	SLOT	23	53.1 N	171.4 E	23	31	M 56			0969.0	3.5	6.0	10	16.5	32	12	29.5
	3EDR	24	33.7 N	167.0 E	00	32	M 47	10 NM	01	1018.5	14.0	22.0	5	19.5	27	5	16.5
CANAL ACE	3FCI	24	55.0 N	176.4 W	00	10	M 60	1 NM	18	0972.5	0.0	6.0	7	28	11	13	31
LEDA MAERSK	OULU	24	54.5 N	174.4 W	00	12	45	.5 NM	63	0972.0	5.0	5.0	10	29.5			
	SLOT	24	53.0 N	170.2 E	05	34	M 50			0974.0	5.0	5.0	8	23	34	10	29.5
CLIFFORD MAERSK	OXZN	24	35.3 N	149.7 E	12	18	55	2 NM	64	1003.5	19.2						
SEALAND INNOVATOR	HPAU	24	32.8 N	160.6 W	18	19	M 45	2 NM	05	1015.0	21.0	21.0	8	16.5	10	8	19.5
VAN HAWK	WGKF	24	42.9 N	149.9 E	18	10	M 45	5 NM		0982.0	8.0	5.0					
SEALAND INNOVATOR	D5ZU	25	54.0 N	155.8 W	00	13	M 55			0992.0	5.5	2.0			13	14	19.5
PRESIDENT MONROE	WGKF	25	40.2 N	146.7 E	06	27	M 45	10 NM	27	1003.5	11.0	7.0	6	19.5	26	8	26
	WNRO	26	24.3 N	120.2 E	00	02	50	5 NM		1019.0	17.2	20.6	5	16.5			
DUBHE	3EDR	26	33.6 N	148.1 E	12	26	M 47	2 NM	62	1004.0	17.0	22.5	6	23	27	5	16.5
	6ZMX	26	36.8 N	174.8 W	18	31	M 50	2 NM	10	0998.0	14.0	18.0	12	19.5	30	15	19.5
PRESIDENT JOHNSON	WVHS	26	38.8 N	178.8 W	18	27	45	2 NM	58	0996.0	8.9	13.9	4	16.5	28	8	34.5
DUBHE	6ZHX	27	36.4 N	173.3 W	00	32	M 51			1003.5	15.0	18.0	12	19.5	31	14	23
ORIENTAL EXECUTIVE	D5AN	27	35.8 N	153.5 E	00	32	M 46	5 NM		1002.0	16.0	20.0	9	14.5	32	10	14.5
WILLIAM E MUSSMAN	D5OE	27	32.9 N	160.3 W	12	27	M 51	5 NM	03	1002.2	17.5						
BARBER TENNESSEE	LFEI	27	36.7 N	160.4 E	12	30	M 54	5 NM	02	1006.0	14.2	18.0	11	24.5			
AQUARIUS	WSKJ	27	20.2 N	131.4 E	12	04	M 50	5 NM	81	1012.0	24.0	26.7	3	19.5	04	4	16.5
ANNIE JOHNSON	SLFT	27	43.5 N	149.4 W	18	15	45	2 NM		1000.5	13.0	10.9	10	39			
	3EDR	28	32.8 N	139.1 E	00	33	M 47	10 NM	02	1025.5	12.0	22.0	7	23	30	5	19.5
WILLIAM E MUSSMAN	D5OE	28	32.4 N	162.1 W	06	23	M 30	5 NM	02	1008.6	20.5		8	11.5	29	14	32.5
CHARLOTTE MAERSK	OYIU	28	40.5 N	160.8 W	12	22	45	10 NM	03	0983.6	14.0		3	13	22	8	32.5
ANNIE JOHNSON	SLFY	28	45.0 N	142.6 W	12	14	45	2 NM	60	1009.0	12.2	10.1					
CORNUCOPIA	KPJC	28	56.4 N	147.5 W	18	13	45	5 NM	60	1011.4	6.7	6.7	7	11.5	14	8	13
ORIENTAL EXECUTIVE	D5AN	29	37.1 N	171.8 E	00	30	M 46	5 NM		1000.0	13.5	16.0	9	14.5	31	10	14.5
GALVESTON	KBGA	29	59.0 N	151.2 W	18	07	60	2 NM	81	0999.1	6.6		6	6.5	09	12	37.5
CHARLOTTE MAERSK	OYIU	29	41.7 N	170.2 W	18	27	45	> 25 NM	25	0986.0	11.0		4	16.5	25	8	23
EXXON NEW ORLEANS	WNDM	29	55.1 N	139.5 W	18	12	M 45	10 NM	03	1009.0	8.9	7.8	5	19.5	18	9	16.5
AMERICA SUN	WNEJ	29	55.5 N	140.6 W	18	12	M 45	5 NM	01	1008.5	9.0	7.8	5	6.5	12	8	11.5
SS B T SAN DIEGO	WSVR	29	55.7 N	140.7 W	18	17	45	5 NM	02	1006.9	7.2	7.8	8	24.5	14	7	29.5
PRESIDENT GRANT	WEZD	30	38.9 N	136.2 W	00	31	M 45	1 NM	58	0999.5	16.0	15.0	4	10	29	3	11.5
SS B T SAN DIEGO	WSVR	30	48.9 N	159.9 W	00	16	M 51	5 NM	61	0981.9	6.1	8.3	5	8	27	14	13
GALVESTON	KBGA	30	55.2 N	140.8 W	00	14	58	5 NM	02	1006.0	7.8	7.2	8	24	14	8	26
CHEVRON CALIFORNIA	WCGN	30	50.6 N	150.1 W	06	10	60	1 NM	81	0996.0	6.1	6.6	5	6.5	10	11	32.5
		30	50.7 N	149.3 W	18	19	30	5 NM		0995.8	7.8	6.7	4	13	19	7	29.5
PRESIDENT HOOVER	WTST	30	54.2 N	163.3 W	18	01	M 47	10 NM	20	0974.2	4.5	6.5	4	13			

Vessel	Nationality	Date	Position of Ship		Time GMT	Wind		Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C		Sea Waves*		Swell Waves		
			Lat. deg.	Long. deg.		Dir. 10°	Speed kt.				Air	Sea	Period sec.	Height ft.	Dir. 10°	Period sec.*	Height ft.
	PACIFIC	DEC.															
	WHPM	1	34.5 N	139.0 E	00	29	M 51	10 NM	01	1004.2	11.1	20.0	9	8	29	10	10
	DZHC	1	35.9 N	146.2 E	06	30	M 47	2 NM	60	0990.0	15.0	20.0	8	8	30	8	8
CHARLOTTE MAERSK	OYIU	1	42.2 N	179.0 E	06	28	45	10 NM	64	1019.8	7.0	6.0	3	10	26	8	14.5
VAN HAWK	OSZU	1	47.8 N	154.9 E	18	20	M **	1 NM	83	0965.0	4.0	1.0	6	13	20	10	31
THOMAS G THOMPSON	KGWT	1	34.5 N	165.0 E	18	18	M 50	2 NM	64	1001.0	20.6		8	16.5	18	8	24.5
SEALAND LIBERATOR	KHRP	1	46.5 N	153.1 E	18	26	M 48	2 NM	26	0970.0	3.0	3.0	6	19.5	27	8	19.5
PACGLORY	5LZB	2	43.6 N	153.4 E	00	28	45	5 NM	01	0991.0	4.2	7.0	5	8	28	7	18
CHARLOTTE MAERSK	OYIU	2	42.0 N	171.9 E	00	18	50	2 NM	63	0991.0	12.0		4	14.5			
VAN HAWK	OSZU	2	47.4 N	153.6 E	06	25	M 50	1 NM	51	0978.5	2.0	0.0	6	14.5	25	10	28
	DZHC	2	37.6 N	154.1 E	12	29	M 60	5 NM	01	1000.6	11.0	18.0	9	11.5	29	9	11.5
PRESIDENT HOOVER	WTST	3	53.3 N	166.4 E	00	22	M 25	10 NM	02	0974.4	2.7	5.5	5	8	22	12	31
GOLDEN DAISY	6ZSG	3	42.1 N	167.2 E	02	26	M 47	5 NM	01	0994.0	7.0	9.0	2	5	26	2	5
LEXA MAERSK	OXFB	3	38.1 N	133.3 W	03	35	64	< 50 YD	63	0992.0	10.0		8	14.5	35	5	11.5
LURLINE	WLVD	3	36.9 N	125.6 W	12	25	49	5 NM	25	0996.7	14.0	13.0	11	19.5			
SS B T SAN DIEGO	WSVR	3	39.9 N	125.8 W	18	36	50	5 NM	18	1001.0	8.3	11.7	8	16.5	36	10	28
PRESIDENT PIERCE	WUBV	3	18.5 N	132.0 E	21	02	45	5 NM	21	1008.0	23.3	25.6	4	10	02	5	16.5
STAR DOVER	H9AU	4	54.5 N	166.8 W	00	23	45	2 NM	61	0992.5	6.5						
PACIFIC VENTURE	HOVS	4	53.0 N	178.3 E	00	26	M 48			0986.0	5.0	0.0	6	14.5	26	6	14.5
SS B T SAN DIEGO	WSVR	4	39.0 N	124.8 W	00	32	47	10 NM	03	1009.5	11.7	18.9	5	13	33	9	23
PRESIDENT PIERCE	WUBV	4	18.9 N	131.0 E	00	02	45	5 NM	60	1013.3	25.6	26.1	7	14.5	02	7	13
SKAUGRAN	LHUK	4	50.4 N	170.4 E	12	23	M 50	1 NM	68	0970.0	2.0						
STAR DOVER	H9AU	6	54.3 N	178.1 W	00	26	47	5 NM		0968.0	4.5						
PACIFIC VENTURE	HOVS	6	48.3 N	162.9 E	00	25	M 47	5 NM	38	0991.0	5.0	0.0	5	11.5	25	5	11.5
CHEVRON LOUISIANA	WNNG	7	41.3 N	126.1 W	18	17	M 50	2 NM	65	1003.3	11.7		4	10	17	8	14.5
MOBIL ARCTIC	KSPY	8	46.3 N	170.5 W	06	26	60	2 NM	07	0993.2	10.0	10.0	6	13	27	14	29.5
SEALAND ENDURANCE	KGJX	8	49.5 N	128.1 W	18	26	M 35	2 NM		0998.5	10.0	11.0	8	31	18	12	26
	HOML	9	38.2 N	158.8 E	06	30	M 70	200 YD		0993.0	12.0						
	HBJO	9	39.4 N	169.2 E	18	25	M 46			0993.0	11.0	13.0					
SEALAND DEVELOPER	KHRH	9	41.5 N	163.0 E	18	32	M 50	2 NM	58	0998.9	4.5	10.0	6	14.5	36	10	16.5
	9VYW	9	37.3 N	149.4 E	22	30	M 13			1020.0	11.0	14.0	10	14.5	27	25	42.5
SEALAND DEVELOPER	KHRH	10	41.8 N	165.3 E	00	32	M 48	5 NM	07	1000.5	4.0	7.0	6	14.5	34	10	16.5
	HBJO	10	39.5 N	172.6 E	06	29	M 52			0992.0	11.0	16.0					
GALLEON PRIDE	DZPR	10	35.5 N	176.9 W	12	20	M 45	1 NM	64	1001.7	16.0	18.0	9	21	21	9	19.5
PRESIDENT VAN BUREN	WWPI	10	39.2 N	171.1 W	12	18	46	2 NM	60	0998.2	11.7	10.6	5	10			
	BLAV	10	34.1 N	165.5 W	18	19	M 47	1 NM	50	1011.0	17.0	20.0					
SEALAND DEVELOPER	KHRH	11	42.6 N	174.6 E	00	33	M 50	5 NM		1004.0	6.0	8.0	7	16.5	33	14	19.5
PRESIDENT GRANT	WEZD	11	47.6 N	131.9 W	06	27	M 54	10 NM	02	0992.5	8.9	10.6	5	14.5	26	10	44
GALLEON PRIDE	DZPR	11	35.7 N	178.3 W	12	28	M 45	2 NM	09	1005.5	13.0	16.0	9	18	28	9	16.5
EXXON PHILADELPHIA	WNFJ	11	40.0 N	124.7 W	18	34	M 60	1 NM	80	1003.7	10.0	13.3	9	8	02	4	3
	3FNV	12	45.5 N	163.1 E	00	16	M 51	.5 NM	61	1003.0	6.0	7.5	7	10	16	8	13
ORIENTAL SOVEREIGN	ELPN	12	34.8 N	155.4 E	00	18	M 50	.5 NM	07	1006.0	19.0	20.0	4	8	12	10	26
PRESIDENT LINCOLN	KDRG	12	39.6 N	149.4 E	06	28	M 47	5 NM	84	1000.5	7.0	13.5	2	19.5	27	3	16.5
	WEZD	12	42.5 N	146.7 E	06	24	M 55	5 NM	01	0989.0	6.1	3.9	XX	10	27	XX	19.5
SAMOA	OXTZ	12	43.4 N	146.7 E	06	27	55	2 NM	60	0986.7	5.0		8	19.5			
NEPTUNE JADE	S6CT	12	38.0 N	162.0 E	06	18	58	10 NM	07	1004.0	17.0	17.5	12	19.5			
STAR DOVER	DZHC	12	43.6 N	152.7 E	12	28	M 45	5 NM	60	0983.0	4.0	5.6	7	29.5	24	7	32.5
SEALAND INNOVATOR	H9AU	12	47.5 N	178.1 W	18	23	M 49	5 NM	02	0994.0	7.0	12.0	8	11.5	23	8	11.5
	WGKF	12	41.0 N	144.1 E	18	27	47	5 NM	83	1013.5	4.0						
	LFEL	13	42.8 N	159.6 E	18	25	M 56	5 NM	02	0990.1	5.0	12.0	6	23	20	XX	32.5
		13	42.0 N	175.6 E	00	15	55	2 NM	52	1008.3	9.8	9.0	XX	13	18	XX	10
SEALAND INNOVATOR	WGKF	13	43.5 N	162.0 E	00	26	M 60	5 NM	02	0992.0	4.0	12.0	6	26	20	10	32.5
ORIENTAL EXECUTIVE	OSAN	13	49.8 N	178.0 W	12	22	M 45	2 NM		1006.0	10.0	14.0					
SEALAND ENDURANCE	KGJX	13	52.0 N	169.0 E	18	22	M 25	10 NM	15	0967.3	3.9	4.0	6	14.5	22	16	29.5
EASTERN PACIFIC	H9XW	14	47.9 N	164.9 E	00	28	M 49	2 NM	83	0990.0	2.0	3.0	9	19.5	28	8	23
SEALAND ENDURANCE	KGJX	14	50.5 N	164.1 E	12	28	M 41	200 YD	89	0985.8	2.2	4.0	9	23	23	14	34.5
SEALAND ENDURANCE	KGJX	15	47.9 N	156.2 E	12	28	M 55	5 NM	16	0994.2	0.0	3.0	8	29.5	23	12	16.5
	3EXQ2	15	54.8 N	179.0 E	19	22	M 55	.5 NM	23	0982.0	3.0		8	19.5	19	10	24.5
	ELDC3	16	53.3 N	179.4 W	00	21	M 33	5 NM	87	0993.0	2.6	3.7	8	16.5	22	14	32.5
	KCAO	16	29.1 N	163.5 W	00	34	30	2 NM	82	1007.7	15.0	22.2	5	13	34	11	29.5
HOEGH MERIT	LEVB	16	47.7 N	155.9 E	00	26	M 49	5 NM	86	0994.0	0.0						
	ELDC3	17	52.2 N	174.2 E	00	23	M 28	5 NM	27	0994.5	2.2	4.0	6	13	23	12	29.5
	ELPN	17	36.2 N	176.4 W	00	16	M 48	1 NM	61	1001.0	17.0	18.0	7	23			
GALLEON HONOR	DZDI	17	41.8 N	148.5 E	04	27	17	.25 NM	29	1002.8	12.1	0.4			28	34	55.5
	WHPM	17	45.0 N	170.0 E	06	24	M 50	5 NM	15	0991.5	3.9	5.0	8	13	22	12	21
ORIENTAL SOVEREIGN	ABUH	17	47.2 N	175.2 W	18	23	M 58	1 NM		0987.0	5.0	5.5					
ORIENTAL EXECUTIVE	OSAN	17	54.3 N	176.7 W	18	11	M 46	2 NM		0992.0	5.0	8.0					
OCEAN LOG	H9ZO	17	43.1 N	143.7 W	18	27	M 60	10 NM	03	1020.0	9.0	8.0					
SEALAND INNOVATOR	WGKF	17	50.5 N	139.6 W	18	06	M 50	2 NM	25	1019.0	5.0	4.0	5	16.5	07	8	19.5
EASTERN PACIFIC	H9XW	18	38.7 N	147.0 E	06	31	M 21	10 NM	02	1007.0	3.0	12.0	5	10	29	6	29.5
ORIENTAL EXECUTIVE	OSAN	18	53.0 N	171.9 E	18	26	M 60	1 NM		0977.0	4.0	6.0					
GALLEON HONOR	OZSD	18	53.0 N	171.8 E	18	30	47	.25 NM	72	0975.0	2.0		8	19.5			
ORIENTAL EXECUTIVE	OZDI	19	42.7 N	166.1 E	03	12	21	< 50 YD	50	1000.0	4.2	0.4			32	32	52.5
BARBARA FOSS	OSAN	19	50.6 N	161.6 E	18	28	M 56	10 NM		0990.0	1.0	6.0					
ORIENTAL EXECUTIVE	WYLW978	20	59.1 N	155.8 W	06	11	M 55	5 NM	81	1031.8	6.0	8.7	3	11.5	12	5	10
	OSAN	20	46.5 N	153.4 E	18	28	M 45	5 NM		1005.0	0.5	5.0					
SKAUGRAN	LHUK	20	34.8 N	157.2 E	18	27	M 47	10 NM	01	1005.0	13.0	21.0	10	11.5			
SIENA	OXFU	21	51.7 N	151.3 W	12	12	M 51	5 NM	81	1015.2	7.6	10.5					
ORIENTAL EXECUTIVE	OSAN	21	41.3 N	146.6 E	18	30	M 50	5 NM		1016.0	8.0	5.0					
SIENA	OXFU	22	52.9 N	155.9 W	00	17	M 50	1 NM	63	1013.8	6.4	8.5	11	29.5			
EASTERN DIAMOND	HODT	22	50.1 N	154.9 W	12	28	M 37	.25 NM	45	1015.5	1.0	1.0	9	18	10	12	29.5
GALVESTON	KBGA	22	51.6 N	131.3 W	12	06	M 45	10 NM	02	1033.9		8.3	3	5	04	5	10
MARGARET JOHNSON	OXNS	22	38.0 N	168.5 W	12	14	M 46	2 NM	63	0996.0	15.8	13.0	6	13			
ORIENTAL SOVEREIGN	ABUH	22	48.1 N	146.4 W	18	18	M 46	2 NM	10	1029.7	8.0	7.5	3	11.5	10	5	16.5
YOCONA WMEC 168	NNHB	22	55.3 N	157.0 E	18	18	M 45	2 NM	25	1011.4	4.4	7.2	10	5	11	15	29.5
YOCONA WMEC 168	NNHB	23	55.5 N	155.9 W	00	10	M 40	2 NM		1035.4	4.4	7.2	10	8	12	15	32.5
ASIA BRAVERY	ABCH	23	33.0 N	145.8 E	05	21	M 45	1 NM	62	1006.0	19.0	21.0	3	16.5	21	6	24.5
SEALAND LIBERATOR	KHRP	23	53.0 N	160.4 W	06	13	M 45	5 NM	00	1025.5	7.5	4.0	7	16.5	10	10	21
VAN CONQUEROR	ABIB	23	43.9 N	155.1 E	12	17	M 46	1 NM	65	0997.5	9.0	5.0					
PRESIDENT HOOVER	WTST	23	42.3 N	154.3 E	12	18	M 45	2 NM	62	0998.1	9.8	11.7	8	14.5	18	8	18
ROSE	6ZCJ	23	38.5 N	141.6 W	18	08	M 45	.5 NM	80	1000.0	12.5	14.0	10	29.5			
NEPTUNE DIAMOND	9VYT	23	50.4 N	162.4 E	18	15	M 45	2 NM	59	1011.0							
SEA FAN	ELCG3	23	39.6 N	141.8 W	23	07	M 47	1 NM	81	1005.0	8.0	11.5	10	24.5	09	8	21
PRESIDENT GRANT	WEZD	24	31.5 N	126.2 E	06	31	M 52	5 NM	27	1021.2	8.3	16.7	5	16.5	29	7	18
ROSE	6ZCJ	24	36.7 N	141.5 W	12	07	M 45	.25 NM	64	0993.8	13.0	16.0					
PRESIDENT HOOVER	WTST	24	46.4 N	164.1 E	12	16	M 52	5 NM	02	1013.3	5.0	5.5	4	6.5	16	7	24.5
B T ALASKA	WFOE	25	38.8 N	124.6 W	06	13	45	2 NM	80	0995.0	14.4	13.3	10	19.5	13	12	19.5
PRESIDENT JEFFERSON	WPGE	25	34.9 N	161.8 W	12	09	55	2 NM	64	0988.8	13.9	14.4	6	10	09	6	10
EXXON NORTH SLOPE	KHLQ	25	13.6 N	95.8 W	14	05	46	5 NM		1017.0	23.3	25.6	1	5	04	13	31
BRIGHT SUN	H3AG	25	40.9 N	147.5 E	18	07	M 50	200 YD	70	0999.0		4.0	12	19.5	07	14	19.5
	HPET	28	36.6 N	159.8 E	18	29	M 53	5 NM	81	1000.0	9.5	18.0					
	HPET	29	36.7 N	161.8 E	00	28	M 45	10 NM	16	0998.0	10.0	16.0	4	8	XX	6	14.5
J T HIGGINS	SLCU	29	34.9 N	180.0 W	18	27	M 45	10 NM	01	0994.5	13.0	16.0	4	14.5			
MAIN EXPRESS	3EED	31	35.9 N	160.7 W	00	18	M 55	.5 NM	44	0984.0	15.0	15.5	7	14.5	14	7	14.5
PRESIDENT JOHNSON	WYHS	31	33.9 N	171.5 E	00	29	38	10 NM	01	1005.0	13.9	13.3	8	13	29	9	29.5
AMERICA SUN	WNEJ	31	34.0 N	171.5 W	18	27	M 48	2 NM	82	0994.5	14.5	15.0	7	14.5	27	6	16.5

+ Direction for sea waves same as wind direction
X Direction or period of waves indeterminate
M Measured wind

NOTE: The observations are selected from those with winds ≥ 40 kn or waves ≥ 20 ft from April through September and 45 kn or 30 ft October through March.

U.S. Voluntary Observing Ship Weather Reports

October, November and December 1983

SHIP NAME	VIA RADIO	VIA MAIL
ABUL KALAM AZAD	40	
AL SALAMA	31	29
ALBERT MAERSK	10	45
ALMERIA LYKES	52	125
AMERICA SUN	53	195
AMERICAN ALTAIR	25	192
AMERICAN ARCO	30	114
AMERICAN EXPLORER	100	115
AMERICAN LEADER	41	103
AMERICAN LIBERTY	61	187
AMERICAN RESERVIST	46	139
AMERICAN TRADER	26	146
AMOCO CAIRO	2	
ARCO ALASKA	11	13
ARCO SAG RIVER	31	26
ASHLEY LYKES	4	23
ASIA HERON	60	154
ATIGUN PASS	72	219
AXEL MAERSK	6	
BALLARD		56
BARBER TAIF	29	47
BARBER TONSBERG	11	51
BAY BRIDGE	86	108
BENJAMIN HARRISON	1	
BIEHL TRADER		11
BORINQUEN	47	126
BUILDER	21	57
CALIFORNIA RAINBOW		34
CASON J CALLAWAY		49
CHARLESTON	20	107
CHERRY VALLEY	49	10
CHEVRON ARIZONA	46	30
CHEVRON COPENHAGEN	38	90
CHEVRON OREGON	45	107
CHRISTIAN MAERSK	14	35
CLARA MAERSK	9	24
COLUMBIA	54	
CORNUCOPIA	18	147
CRYSTAL REED	9	
DA POSTO	9	34
DAVID P REYNOLDS	62	153
DEL ORO	3	
DELTA CARIBE	40	150
DIANA	11	44
DOLLY TURMAN	14	
DURABLE	18	21
EASTERN PACIFIC	79	98
EDGAR M QUEENY		15
EDWIN H GOTT		172
ENDEAVOR	10	
ESSO PALM BEACH		31
EXPORT CHAMPION	12	17
EXXON BALTIMORE	45	77
EXXON HOUSTON	18	27
EXXON NEW ORLEANS	74	61
EXXON SAN FRANCISCO	4	10
FERNCROF	64	66
FORTALEZA	144	238
FREDERICKSBURG	54	112
GALLEON DIGNITY	33	97
GALLEON TRUST	20	
GAS LIMA	29	
GEORGE A STINSON		64
GLACIER BAY	61	97
GOLDEN ORCHID	8	
GREEN AUKLET	51	
GREEN STAR	37	21
GULF TRADER	22	60
HAMILTON WHEC 715	15	
HARBANGER	1	
HOEGH CAIRN	52	47
HOEGH MIRANDA	11	182
HOTAKA MARU	187	80
INGER	54	191
ITALICA	25	60
J.A.W. IGLEHART		131
JAMES LYKES	2	12
JEAN LYKES	27	8
JUNO	21	47
KARMILA	6	
KENNETH E HILL	8	112
KNORR	79	137
KOREAN PRIDE	9	5
KOREAN WONIS SUN	11	
LASH ATLANTICO	27	91
LAVAUX	43	69
LETITIA LYKES	1	
LONG LINES	6	11
LURLINE	82	212
M.V. TENGHBANK	123	
MAERSK TRITON	54	76
MAJAPAHIT	37	108
MALLORY LYKES	7	100
MANULANI	48	109
MARGARET LYKES	3	23
MATAGAM	7	
MAYON	1	17
MELVIN H. BAKER	43	
MIDGETT WHEC 726	23	5
MING GLORY	8	20
ACACIA	23	70
ALASKA STANDARD	30	73
ALERT	50	
AMCO TRADER	74	113
AMERICAN ACCORD	55	119
AMERICAN APOLLO	41	107
AMERICAN ARROSY	70	142
AMERICAN HIGHWAY	17	
AMERICAN LEGACY	66	185
AMERICAN LYNX	50	177
AMERICAN RESOLUTE	69	166
AMERICAN VERA	35	106
AMOCO YORKTOWN	23	25
ARCO ANCHORAGE	51	73
ARCO TEXAS	26	71
ASIA BEAUTY	51	68
ASIA HONESTY	47	
ATLANTIC OCEAN	1	
B T ALASKA	50	247
BALTIMORE TRADER	9	14
BARBER TENNESSEE	25	49
BARBER TSU	16	
BAYAMON	6	10
BENSON FORD	2	105
BOGASARI DUA	82	190
BRISMT SUN	70	173
BUNTA MELAWIS	132	179
CANAL ACE		153
CATHRIN	1	
CHARLOTTE MAERSK	82	226
CHESAPEAKE	65	77
CHEVRON BURNABY	14	212
CHEVRON LOUISIANA	32	33
CHEVRON PACIFIC		174
CHRISTOPHER LYKES	7	
CLIFFORD MAERSK	12	171
COLUMBUS AMERICA	50	
COSMOS	77	141
CRYSTAL STAR	37	
DALLAS WHEC 716	4	
DAVID PACKARD		198
DEL SOL	5	46
DELTA MAR	6	
DISCOVERER 055	344	112
DON JUAN	50	93
EASTERN BRIDE	36	
EASTERN ROYAL	43	
EDITA	15	
EILEEN INGRAM	78	132
ERNEST R BREECH		73
EVEF SPRING	16	4
EXPORT COMMERCE	42	108
EXXON EATON ROUGE	7	13
EXXON HUNTINGTON	33	60
EXXON NEWARK	9	27
EXXON WASHINGTON	14	20
FESTIVALE	17	25
FF CARRIER	22	44
FRIENDSHIP	147	
GALLEON HONOR	6	4
GALVESTON	58	167
GEMINI	4	
GEORGE M HUMPHREY	14	152
GLOBAL FRONTIER	94	190
GOAF	4	11
GREEN FOREST	36	
GUADALUPE I	15	18
GULFPRIDE	1	
HANJIN KWANGYANG		55
HENRY FORD II		19
HOEGH CLIPPER	31	
HOEGH SUN	1	25
HOWELL LYKES	5	28
IRIS ISLAND		8
J LOUIS	32	92
JADRAN	1	
JAPAN ACE	38	11
JOHN C HUNSON		118
JUPITER NO 1	18	27
KAUAI	67	135
KEYSTONE CANYON	20	73
KOFUKU MARU	17	119
KOREAN WONIS JIN	115	175
KPPAN	15	
LASH ITALIA	30	72
LEDA MAERSK	46	88
LEXA MAERSK	30	68
LOUISE LYKES	10	
LYNCH T-AGOP 7	67	172
M/V EASTERN WISEMAN	11	
MAERSK WAVE		65
MALACCA	46	
MAMMOTH FIR	7	129
MARATHA SHOGUN	22	
MARTA TOPIC	21	46
MAUT	89	227
MC ARTHUR	19	
MEDEA	107	129
MILLER FREEMAN	74	11
MING MOON	7	
ADDIRIYAH	30	
ALASKAN	54	69
ALEUTIAN DEVELOPER	9	117
AMCO VOYAGER	53	179
AMERICAN ACE	58	127
AMERICAN AQUARIUS	23	48
AMERICAN ASTRONAUT	44	12
AMERICAN LANCER	12	112
AMERICAN LEGEND	52	118
AMERICAN MARKETER	39	33
AMERICAN PIGEL	19	90
AMERICANA	20	21
ANNIE JOHNSON	25	29
ARCO FAIRBANKS	22	34
ARCTIC TOKYO		212
ASIA BRAVERY	10	122
ASIA HUNTER	11	95
ATLANTIC RAINBOW	27	
BACAU	20	
BANGLAR PROGOTI	3	
BARBER TERRIER	21	48
BARRANCA	144	247
BAYANO	43	136
BERNINA	2	124
BOHEME	17	38
BRINTON LYKES	2	
C K APOLLO	37	
CAPRICORN	21	159
CENPAC 7	27	63
CHASE WHEC 718	15	
CHESNUT HILL	41	85
CHEVRON CALIFORNIA	85	182
CHEVRON MISSISSIPPI	65	128
CHEVRON PERTH		148
CHUEN ON	28	100
CLOVER CGC	2	
COLUMBUS LOUISANA	125	
COURAGEOUS WHEC 692	16	
CYGNUS	49	89
DANA AFRICA	12	
DAVID STARR JORDAN	3	6
DELAWARE II	24	56
DELTA NORTE	12	25
DISCOVERER SEVEN SEAS	201	134
DRAGOR MAERSK	41	92
EASTERN DIAMOND	37	182
EASTERN VENTURE	62	25
EDWARD R. GREENE	1	29
ELIZABETH LYKES	70	88
ESSO EVERETT	6	
EVEF VALUE	1	
EXPORT FREEDOM	41	95
EXXON CHESTER	15	11
EXXON JAMESTOWN	16	34
EXXON NORTH SLOPE	20	75
FAIRWEATHER	20	30
FIREBUSH WLB 393	21	
FRANCIS SINCERE NO 6	28	
FRUITION	4	
GALLEON INTEGRITY	31	58
GAMA OETAN	4	20
GENEVIEVE LYKES	15	88
GEORGIA BULLDOG		4
GLOMAR CHALLENGER	85	119
GREAT LAND	22	66
GREEN FOWARD	39	1
GULF RANGER	1	
H J HAYNES		32
HANJIN POHANG	13	
HERBERT C. JACKSON	6	98
HOEGH MAILIN	56	33
HOHSING ARROW	1	48
HUDSON T-AO 184	87	135
IRVIN L. CLYMER	2	30
J T HIGGINS		259
JALAMOKAMPI	7	
JAPAN AMBROSE	73	60
JOHN LYKES		51
JUSTINE FOSS		169
KEIYO	17	67
KEYSTONER	56	178
KOREAN FIR	9	
KOREAN WONIS ONE	9	46
L.W. FUNKHOUSER		26
LASH PACIFICO	13	27
LEISE MAERSK	55	128
LICA MAERSK	41	102
LUCENT STAR	19	
M P GRACE	1	
M/V MYRON C. TAYLOR	3	
MAHARSHI KARVE	1	
MALAYAN KING		49
MANHATTAN DUKE	40	
MARCONA CONVEYOR		88
MARJORIE LYKES	48	64
MAUMEE	78	181
MELLON WHEC 717		57
MESABI MINER		150
MING AUTUMN	6	
MING STAR	46	
ADRIAN MAERSK	41	73
ALBATROSS IV	63	109
ALLISON LYKES	3	56
AMELIA TOPIC	29	45
AMERICAN ALLIANCE	79	189
AMERICAN ARCHER	86	172
AMERICAN DRACO	30	118
AMERICAN LARK	58	142
AMERICAN LEGION	11	106
AMERICAN MERCHANT	106	219
AMERICAN SUN	20	19
AMOCO BALTIMORE	29	
AQUARIUS	55	180
ARCO JUNEAU	29	32
ARGONAUT	39	98
ASIA CHMICHO		4
ASIA NO 18	44	74
AUSTRAL PIONEER	8	30
BALO BUTTE	19	163
BARBER PRIAM		55
BARBER TOBA	28	65
BASSWOOD WLB388	20	
BELO ORIENTE	42	97
BIBB WHEC 31	52	
BON BATEAU	4	
BROOKS RANGE	15	46
CALCITE II		50
CARNIVALE	8	
CHARLES LYKES	68	132
CHASTINE MAERSK	121	
CHEVRON ANTWERP		187
CHEVRON COLORADO	49	109
CHEVRON NORTH AMERICA	1	
CHEVRON WASHINGTON	16	
CITRUS WLB300	13	
CLOVER TRUST	3	
CONDORA	43	120
COVADONGA	26	69
D L BOWER		41
DANA AMERICA	4	
DEFIANCE	12	127
DELAWARE TRADER	7	7
DELTA SUD		3
DOCTOR LYKES	31	149
DUBHE	6	65
EASTERN FRIENDSHIP	36	57
EATON GLORIA	3	
EDWARD RUTLEDGE	53	94
ELTON HOYT II		172
ESSO KOBE	1	
EXPORT CHALLENGER/	1	
EXPORT PATRIOT	34	127
EXXON GETTYSBURG	6	2
EXXON LEXINGTON	7	11
EXXON PHILADELPHIA	7	27
FALSTRIA	49	57
FJORD STAR	28	225
FREDERICK LYKES	28	
GALLATIN WHEC 721	4	7
GALLEON PRIDE	5	21
GAMA ROBUSTA	8	
GEORGE A SLOAN	3	109
GERONIMO		94
GOLDEN DAISY		45
GREAT OCEAN	21	19
GREEN SAIKAI	23	19
GULF MERCHANT	3	
H. LEE WHITE		97
HARBOUR BRIDGE	58	110
HILLYER BROWN	3	
HOEGH MERIT	59	34
HOHSING BREEZE	26	87
IKAN KERISI	44	68
IRVING MIAMI	4	
J. L. MAUTHE		103
JALAWINAR	31	76
JAPAN APOLLO	88	93
JOSEPH LYKES	29	
KANE T-AGS 27	38	42
KENAI		19
KIWALAN	1	
KOREAN JACEWON	64	143
KOREAN WONIS SEVEN	25	74
LAKE TAHOE		10
LAURA MAERSK	20	78
LESLIE LYKES	54	
LILLOOET	97	176
LUNA MAERSK	17	49
M.V. DACEBANK	66	
MAERSK NEPTUN	9	
MAIN EXPRESS	73	48
MALAYAN QUEEN	38	84
MANUKAI	101	233
MARGARET JOHNSON	60	99
MASON LYKES	2	74
MAYO LYKES	9	70
MELVILLE	141	
METEOR T-AKR 9	66	67
MING GALAXY	6	20
MING SUN	2	15

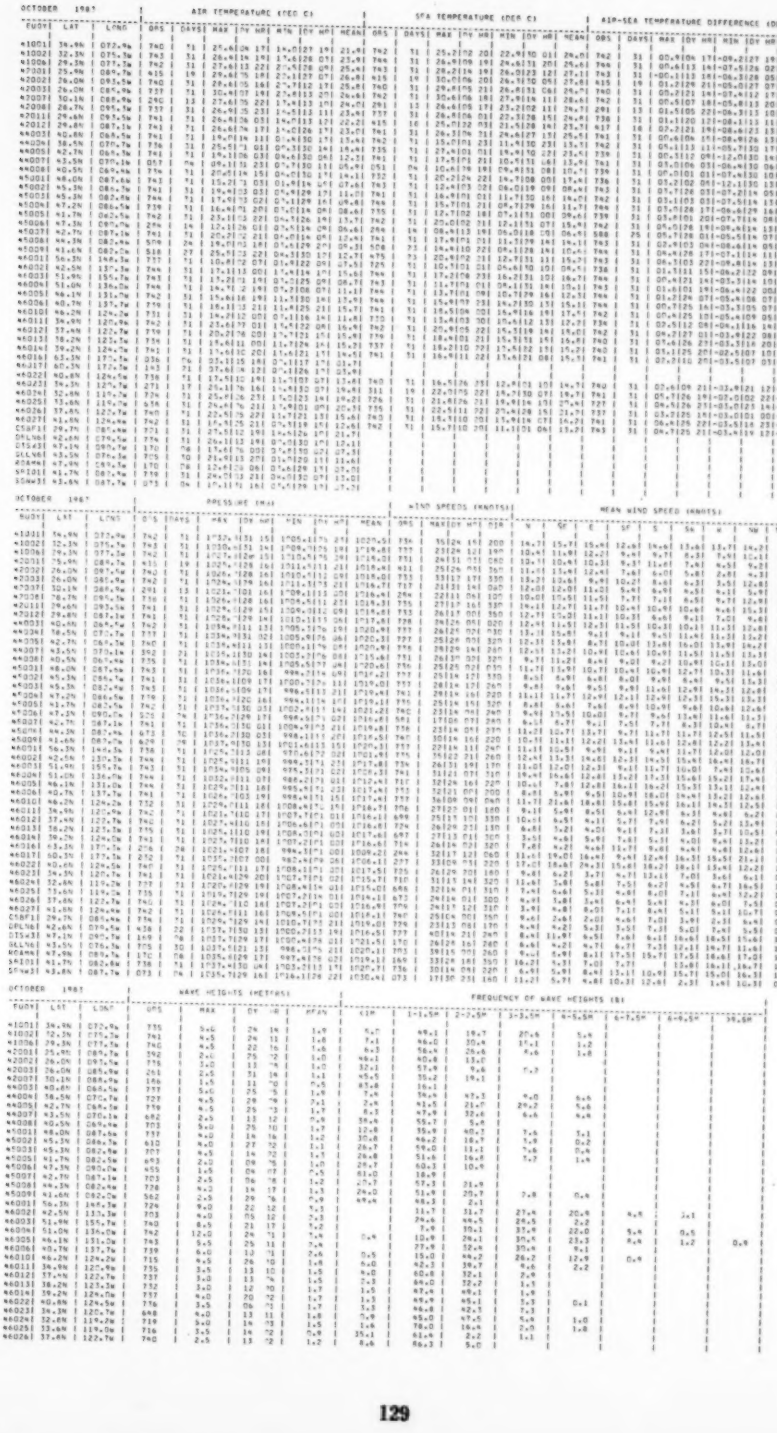
TOTAL WEATHER REPORTS RECEIVED FROM US COOPERATIVE OBSERVING SHIPS OCTOBER-DECEMBER 1983

SHIP NAME	VIA RADIO	VIA MAIL
MISSION SANTA CLARA	19	
MOBILFUEL	19	
MUNRO WMEC 724		98
NAVASOTA	17	
NEPTUNE PEARL	57	161
NORSE PILOT	101	
OCEAN LOG		64
OCTA	8	33
OLEANDER	54	155
ORIENTAL EXECUTIVE	40	160
OTTO N. MILLER	43	108
OVERSEAS MARILYN	20	63
PACMARON	23	16
PACGLORY	57	52
PACIFIC SUNSHINE	3	23
PACMAJESTY	24	8
PACSTAR	44	
PARALLA	31	71
PETERSBURG	17	96
POLAR ALASKA		21
POLYNESIA	28	163
PRESIDENT CLEVELAND	40	123
PRESIDENT JEFFERSON	70	143
PRESIDENT MADISON	90	111
PRESIDENT ROXAS	28	79
PRESIDENT VAN BUREN	57	169
PRINCE OF TOKYO	84	190
PUNTA MALVINAS	16	22
RALPH B JOHNSON	1	
RELIANCE WMEC 615		45
ROBERT E LEE	7	38
RUSH WMEC 723	4	75
S.S. LNG TAURUS	19	145
S/S MOBILOIL	18	
SAM HOUSTON	25	29
SAN MARCOS	20	
SANTA FE	3	29
SANTA MARIA	30	59
SAUDI RIYADH	59	57
SEA KING NO I	26	63
SEALAND DEFENDER	59	184
SEALAND EXPRESS	33	94
SEALAND LEADER	49	191
SEALAND PIONEER	14	135
SEALIFT ANTARTIC	90	
SHANGRI LA	2	
SHIRLEY LYKES	12	31
SKAUGRAN	54	193
SOHIO INTREPID	27	89
SOVEREIGN VENTURE	8	22
SS P T SAN DIEGO	41	308
STAR ENTERPRISE	46	
STELLA LYKES	54	143
STR. WILFRED SYKES	11	145
SUN VIKING	10	
T F L INDEPENDENCE	42	62
TEXACO GHENT	60	
TFL ENTERPRISE	40	118
TFL JEFFERSON	2	83
TILLIE LYKES	50	175
TOWER BRIDGE	96	52
TROPIC SUN	1	
UNITED SPIRIT	25	286
USCGC LAUREL (WLB 291)	6	20
USCGC SUNDEW WLB 404	1	65
USNS BARTLETT	68	167
USNS NODAWAY (T-AO678)		21
USNS SIRIUS		215
VAN CONQUEROR	60	215
WALCHAND	90	79
WECONA	43	137
WILLIAM A. POESCH		36
WOLVERINE		55
YOCONA WMEC 168		70
ZOELLA LYKES	13	87
3EKJ2		55
3EWP2		55
3FDZ2		11
3FXH	19	26
5LUB	19	81
8KCJ	10	11
A8BM	10	12
BLEM	29	65
DD5X		3
DZLF		85
ELDC3		59
ELPN	14	18
H3SG	10	44
HONF	7	67
HZST		7
JKMG	13	15
KCAO	16	64
KMOS		12
LFEL	5	36
NHHX		42
NZIT		9
OZSO	23	72
WFKW	23	67
WNDD		25
WZHK	31	77
MOANA PACIFIC	71	147
MOKU PAHU	143	195
NACIONAL MONCHIQUE	30	20
NEPTUNE CRYSTAL	56	
NEW INDEPENDENCE	47	49
NORTHERN LIGHT	24	
OCEAN STEELHEAD	65	113
OGDEN DYNACHEM		100
OLGA TOPIC	36	
ORIENTAL KNIGHT	12	43
OVERSEAS ARCTIC	68	198
OVERSEAS NEW YORK	42	28
PACPARONESS	22	
PACIFIC ARROW	191	68
PACIFIC VENTURE	72	31
PACMERCHANT	33	14
PAN DYNASTY	8	6
PASSUMPSIC TAO-107	95	115
PHILADELPHIA	62	164
POLAR SEA	93	
PORTLAND	30	54
PRESIDENT GRANT	54	128
PRESIDENT JOHNSON	96	166
PRESIDENT MC KINLEY	110	271
PRESIDENT TAFT	4	
PRESIDENT WASHINGTON	69	64
PRINCE WILLIAM SOUND	56	178
QUATSINO SOUND		152
RANGE SENTINEL	8	
RESEARCHER	128	119
ROSE		61
RUTH LYKES	14	83
S.S. MOBIL MERIDIAN	77	197
SACRAMENTO	27	104
SAMOA	39	69
SAN PEDRO	57	94
SANTA JUANA	24	31
SANTA MARIANA	16	
SAVONITA	32	20
SEA QUEEN NO 1	68	135
SEALAND DEVELOPER	108	221
SEALAND FREEDOM	39	139
SEALAND LIBERATOR	22	176
SEALAND PRODUCER	49	188
SEALIFT ARABIAN SEA	4	
SHANNON	84	
SHOSHONE T-AO 151	51	55
SKOUBORD	50	156
SOLON TURMAN	5	24
SPARROWS POINT		95
STAR CARRIER	20	
STAR MALAYSIA	7	54
STOLT LION	1	
STREAM DOLPHIN	42	29
SUNBELT DIXIE	173	134
T F L LIBERTY	38	183
TEXACO RHODE ISLAND	4	44
TFL EXPRESS	30	181
THOMAS G THOMPSON	67	64
TONTI TOPIC	14	161
TOWNSEND CROMWELL	152	166
TUMTLCO	40	
UNIVERSE	20	
USCGC LIPAN	22	
USCGC VALIANT(WMEC-621	4	
USNS COMET TAKR 7	77	111
USNS PAWCATUCK TAO-108		101
USNS SOUTHERN CROSS	72	68
VAN HAWK	65	167
WALTER A. STERLING		164
WESTERN SUN		86
WILLIAM E MUSSMAN	50	141
WORLD CANDOUR	15	53
YUKON T-AO 152	83	104
3EDX		23
3EP72		24
3EWC	38	99
3FMU	20	51
3ZZC		58
5LVC		46
8LUB	17	18
8MFK	13	15
8MDP	6	19
DDKY	7	93
ELAJA		7
ELHJ	14	13
ELZL2		15
H8JO	25	61
HPAU	19	42
HZTP	10	35
JRBC	58	30
KGJF	19	60
KNFO		3
LGSY		19
NJOV	12	42
OWCY	3	27
VTJS	14	42
WGJF	16	67
WSKY		22
WZJC		23
MOBIL AERO	2	13
MORMACMOON	8	57
NAGARA	7	
NEPTUNE DIAMOND	60	132
NEWARK	30	160
NORWAY	36	
OCEANIC	76	152
OGDEN THAMES	22	
ORCO MINER	28	
ORIENTAL SOVEREIGN	57	84
OVERSEAS CHICAGO	28	71
OVERSEAS ULLA	1	
PACDUKE	43	47
PACIFIC ERA	38	
PACIFIC WING	64	
PACMONARCH	24	
PAN PACIFIC	3	
PAUL PIGOTT	5	
PHILIP R CLARKE		33
POLAR STAR WAGB-10	8	
POTOMAC TRADER	12	58
PRESIDENT HOOVER	72	136
PRESIDENT KENNEDY	18	12
PRESIDENT MONROE	42	156
PRESIDENT TAYLOR	20	45
PRESIDENT WILSON	70	103
PROVINCIA DE EL ORO	8	
QUINTINA	57	
RASLITN	1	
RIGOLETTO	114	107
ROSSETTI	1	
S P LEE	75	177
S.S. PONCE	1	
SAINT LOUIS	37	90
SAMUEL S	36	16
SANSINENA II	6	
SANTA LUCIA	15	13
SAPPHIRE	7	12
SEA ASTRA	44	85
SEALAND ADVENTURER	59	187
SEALAND ECONOMY	27	172
SEALAND INDEPENDENCE	68	180
SEALAND PACER	21	179
SEALAND VENTURE	55	151
SEALIFT MEDITERRANEAN	51	99
SHERMAN WMEC 720	36	14
SIENA	43	145
SNOW CRYSTAL	30	137
SOUTH LIGHT	6	
SPRAY CAP	13	
STAR DIEPPE	46	
STAR THAILAND	34	
STONEWALL JACKSON	22	37
STREAM HAWSER	2	
SURVEYOR	66	27
TAIKO VENTURE	29	
TEXAS TRADER	106	170
TFL FRANKLIN	28	
THOMPSON LYKES	15	63
TONSONIA	23	37
TOYOTA #24	144	
TUSTUMENA	1	
USCGC ACACIA (WLB406)	8	
USCGC RED CEDAR		20
USCGC VIGOROUS	56	
USNS MOHAWK	46	52
USNS RIGEL TAF58	41	97
USNS SPICA	23	
WELMA LYKES	45	97
WALTER RICE	17	138
WESTWARD VENTURE	68	136
WILLIAM HOOPER	10	54
WORTH	26	29
ZEPHUNTER	57	162
3EBF	3	21
3EU8	11	13
3EW02		74
3FPJ	8	10
5LGF	21	106
6ZRP	4	4
9VHM	13	24
9ICO		24
9SD2	9	55
9WJR	12	51
9LACN		68
ELKN	8	2
9PHV	2	75
H8QP		30
HPET	17	61
JCGV	26	23
K6JX		14
K6YE	10	45
KSRC		3
LLEF		20
NTRI	21	56
OXIT		50
WRVY	11	27
WHRM		44
WSPP		25
ZCUT	25	12
MOBIL ARCTIC	81	269
MT MITCHELL	149	206
NANCY LYKES	11	88
NEPTUNE JADE	64	150
NORDHVAL	2	
OAKLAND	57	179
OCEANOGRAPHER	2	
OJI GLORIA	76	
ORCO TRADER	87	118
ORIENTAL TAIO	22	
OVERSEAS JUNEAU	28	64
OVERSEAS VIVIAN	28	67
PACEMPEROR	30	
PACIFIC SAGA	39	
PACLADY	17	11
PACNOBLE	25	
PAN TIDE	9	
PAUL THAYER		89
PITTSBURGH	14	
POLARIS	1	
PRESIDENT ADAMS	21	34
PRESIDENT JACKSON	52	56
PRESIDENT LINCOLN	71	136
PRESIDENT PIERCE	65	171
PRESIDENT TYLER	63	159
PRIDE OF TEXAS	1	
PUNTA BRAVA	19	
RAINIER	4	
REGINA MAERSK	50	157
ROACHBANK	58	
ROYAL VIKING SKY	11	
S T CRAPO	12	133
S/S EXXON BOSTON	89	134
SALVADOR	20	49
SAN JUAN	86	101
SANTA CLARA	18	26
SANTA MAGDALENA	12	39
SAUDI MAKKAH	35	
SEA FAN		141
SEALAND CONSUMER	59	189
SEALAND ENDURANCE	75	60
SEALAND INNOVATOR	67	134
SEALAND PATRIOT	54	102
SEALAND VOYAGER	76	168
SEAPAC LEXINGTON	1	
SHINKOO MARU	52	50
SINCERE #3	1	
SOCONY VACUUM	6	136
SOUTHWEST CAPE	44	
SPRAY STAN	16	
STAR DOVER	71	188
STARWARD	18	
STORIS WMEC 38	1	
SUGAR ISLANDER	2	29
SWEETBRIER WLB 405	15	
TAMAROA WMEC-166	58	37
TFL DEMOCRACY	55	64
TFL FREEDOM	26	112
THOMPSON PASS	1	
TORRENT	32	
TRANSCOLUMBIA	5	64
TYSON LYKES	67	188
USCGC IRONWOOD WLB 297	12	
USCGC RESOLUTE WMEC 62	69	
USNS APACHE	5	
USNS NEOSHO T-AO-143	11	15
USNS SEALIFT PACIFIC	124	120
VALLEY FORGE	58	79
VIOLET	41	
WASHINGTON TRADER	25	192
WESTWIND WAGB 281	200	73
WINTER STAR	24	77
WYMAN TAG-534	1	
ZIM HONGKONG	35	
3EDR		23
3EVQ2		26
3EZL62		11
3FWV		9
5LOT	1	19
8401		1
9VYW		47
8LAV		22
9SKF		44
DZHC	5	47
ELBJ3		106
ELOC	23	32
H3D9	28	69
HOML	27	98
HPRL		44
JERV	37	45
KAFO		15
KINJ		38
KZJA		43
NCDS		42
NVOP		11
OXTH	1	5
WDZB	22	67
WLDU	35	90
WTGO		46

SUMMARY: GRAND TOTAL VIA RADIO 24420 GRAND TOTAL VIA MAIL 61073

U.S. NDBC Climatological Data

October, November and December 1983



OCTOBER 1981			TOTAL FREQUENCY OF WIND SPEEDS (%)							TOTAL FREQUENCY OF WIND DIRECTIONS (%)							
BUOY	LAT	LONG	CALM	1-3KT	4-10KT	11-21KT	22-33KT	34-47KT	>47KT	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.4W			4.1	22.9	53.9	17.8	0.2								
41002	32.3N	075.3W			10.3	38.5	40.8	10.3		13.9	19.3	17.1	7.2	12.4	9.1	9.0	12.1
41004	29.3N	079.3W			9.7	40.9	39.4	9.8		7.0	21.7	22.7	9.9	12.1	7.7	9.0	9.9
42001	25.9N	089.7W			7.8	39.8	40.4	11.9		6.9	30.0	30.6	15.2	7.9	3.4	3.5	5.0
42002	26.0N	093.5W			3.8	49.1	38.8	8.2		13.6	24.6	24.6	6.8	0.9	2.9	0.9	3.1
42003	26.0N	085.9W			9.8	42.8	38.3			13.0	29.0	30.0	5.1	0.5	3.0	0.3	7.2
42007	30.1N	088.8W			9.8	42.8	38.3			13.0	29.7	30.6	9.0	4.0	3.0	1.6	2.1
42008	28.7N	090.1W			9.8	46.1	37.7	6.4		7.3	25.8	19.6	14.6	11.3	10.1	6.5	4.8
42011	29.6N	093.5W	0.1		1.9	33.3	48.7	16.0		14.5	13.8	15.1	29.0	5.0	2.8	0.7	4.8
42012	29.8N	087.1W			3.0	35.2	49.1	12.6		17.0	19.7	25.8	25.6	8.3	5.6	1.3	2.0
42013	40.4N	066.5W			6.0	35.8	42.9	5.3		14.5	16.9	40.5	14.0	5.0	3.5	2.8	4.8
44004	38.5N	070.7W			5.8	29.3	50.6	14.3		11.8	21.4	11.4	5.0	14.0	13.3	13.4	9.6
44005	42.7N	068.3W			1.8	15.6	54.0	4.6		12.3	29.5	6.7	3.9	6.1	12.0	13.9	11.5
44007	43.5N	070.1W			7.1	40.3	47.7	5.1		17.5	21.1	7.1	6.5	11.1	19.0	7.3	11.4
44008	40.5N	069.4W			2.7	35.8	53.8	7.8		12.7	15.7	6.7	7.6	11.1	16.2	18.5	9.4
44011	41.0N	067.6W			6.2	55.0	36.9	1.9		10.7	23.5	14.1	8.2	10.7	9.4	15.3	8.5
44012	45.3N	066.1W			3.1	38.0	54.4	2.9		10.7	21.4	9.1	12.3	14.2	11.8	13.1	16.5
44013	42.3N	070.8W			3.0	42.1	50.4	4.5		10.4	17.0	14.6	6.5	13.1	19.6	11.3	12.6
44014	37.2N	074.6W			3.9	43.6	43.2	9.3		9.3	8.7	9.5	13.0	14.9	15.1	14.4	14.3
44015	41.1N	082.5W			5.9	43.2	43.2	7.7		9.3	8.7	9.5	12.8	13.2	13.1	11.5	22.1
44016	47.3N	090.0W			6.4	41.8	42.9	8.9		7.3	15.1	15.2	12.3	12.9	19.3	9.6	8.4
44017	42.7N	087.1W			2.6	38.9	47.6	10.9		12.6	9.9	16.1	10.6	15.8	10.4	15.9	10.1
44018	41.9N	082.4W			3.0	34.5	51.5	11.0		8.6	11.0	13.6	13.8	13.3	15.7	11.0	13.0
44019	41.6N	082.7W			5.4	41.8	42.4	7.4		8.6	13.0	13.6	13.8	13.3	15.7	11.0	11.0
44021	40.3N	069.3W			2.9	33.4	52.4	11.3		10.3	15.2	12.6	18.1	11.4	10.2	13.4	9.1
44022	42.5N	070.1W			2.9	33.4	52.4	11.3	0.6	2.9	3.6	6.0	9.6	13.4	21.5	23.7	17.5
44023	43.5N	065.0W			3.1	40.3	47.7	8.9		10.7	13.5	11.0	7.8	17.1	14.9	5.8	12.3
44024	42.0N	065.0W			4.2	43.1	49.2	3.5		10.7	13.5	11.0	7.8	17.1	14.9	5.8	12.3
44025	40.1N	073.2W			5.5	36.8	47.0	10.7		5.0	8.8	8.8	6.8	11.5	23.5	21.5	9.9
44026	44.1N	131.0W			3.4	39.4	53.4	3.8		5.0	1.2	1.5	5.5	19.1	24.4	20.8	20.6
44027	44.7N	124.5W			3.4	39.4	53.4	3.8		5.0	1.2	1.5	5.5	19.1	24.4	20.8	20.6
44028	40.7N	137.7W			3.7	32.4	53.9	10.2		7.1	5.6	10.9	5.6	10.9	16.9	17.7	20.6
44029	46.2N	124.2W		16.8	10.1	50.7	16.2	2.8	2.8	11.6	16.3	11.9	6.3	6.7	8.1	11.0	11.9
44030	39.9N	128.9W			15.8	53.7	30.5			11.6	16.3	11.9	6.3	6.7	8.1	11.0	11.9
44111	34.9N	120.9W			12.4	39.3	44.2	4.1		21.9	6.0	14.3	6.6	20.4	6.0	8.9	13.9
44121	37.4N	122.7W			10.0	40.3	42.9	6.8		21.9	6.0	14.3	6.6	20.4	6.0	8.9	13.9
44131	38.2N	123.3W			19.0	42.6	32.4	6.0		11.0	2.0	1.8	7.4	11.6	9.7	5.4	49.8
44161	39.2N	124.7W			13.2	48.3	48.6	2.0		5.2	2.1	1.4	9.5	6.9	3.6	9.4	58.0
44162	43.3N	127.1W			9.8	28.3	48.7	13.5		25.2	5.2	1.4	12.2	6.3	3.6	5.0	41.2
44163	40.3N	172.1W			2.6	32.0	41.9	13.5		17.2	28.2	20.5	5.3	6.5	9.2	5.4	7.8
46022	40.8N	124.5W			19.8	56.2	19.2	2.8		22.6	9.9	6.7	3.3	13.1	6.9	6.9	17.3
46023	34.3N	120.7W			7.8	39.2	43.7	10.6		12.1	1.9	1.6	8.3	9.7	5.9	5.2	54.1
46024	32.8N	119.5W			7.6	50.6	37.9	3.9		12.1	1.9	1.6	8.8	6.8	3.7	4.9	60.1
46025	33.6N	119.0W			23.0	63.2	9.7	4.1		7.7	2.9	2.9	5.6	7.1	7.1	10.6	63.9
46026	37.8N	122.3W			18.8	52.3	22.7	1.2		7.7	2.9	2.9	3.6	6.9	6.9	9.3	55.5
46027	41.8N	124.4W	16.8	10.1	50.7	16.2	2.8			1.6	4.3	1.1	9.3	10.8	8.1	11.0	51.9
46028	35.7N	121.9W		15.8	53.7	30.5				13.3	9.6	7.4	13.4	13.4	3.6	2.4	14.8
46114	42.6N	124.5W	4.3	29.9	46.9	2.0	0.3			15.8	15.2	12.2	5.9	6.3	4.8	5.8	4.0
46119	33.8N	118.0W	1.9	12.0	48.8	29.8	7.5			5.6	12.3	11.2	7.1	10.6	9.3	12.0	7.4
46131	34.3N	119.8W	4.1	9.8	49.3	32.4	4.4			7.2	17.6	14.0	10.1	10.4	10.1	11.2	9.4
46211	33.5N	118.3W	0.6	4.8	39.6	45.9	9.1			5.6	22.2	3.7	20.3	13.3	9.2	10.9	9.7
46221	33.9N	118.6W	1.9	7.0	39.7	43.5	7.8			7.9	7.6	3.2	7.1	7.1	7.1	10.9	9.7
46222	33.6N	117.9W	1.2	9.0	43.4	42.0	4.4			7.2	17.6	14.0	10.1	10.4	10.1	11.2	9.4
46224	33.2N	117.3W	1.2	9.0	43.4	42.0	4.4			7.9	9.5	11.0	15.6	15.6	12.7	10.1	16.8

OCTOBER 1981			% FREQUENCY OF WIND SPEEDS (KTS)								% FREQUENCY OF WIND SPEEDS (KTS)								% FREQUENCY OF WIND SPEEDS (KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.4W	0.5	1.6	0.4	0.4	0.2	1.1	0.6	1.0	2.4	2.9	4.6	2.1	3.1	2.3	2.6	1.0	9.4	12.2	7.4	3.7	6.8	5.4	4.3	6.1
41002	32.3N	075.3W	0.8	1.9	1.1	0.7	1.6	1.9	1.7	3.1	4.5	6.5	4.7	6.7	5.1	4.6	4.0	3.1	11.5	11.6	11.4	6.5	3.1	1.6	2.7	4.4
41004	29.3N	079.3W	1.2	2.1	1.3	1.0	0.5	1.4	1.0	1.3	2.2	3.1	3.7	5.1	5.0	5.1	5.1	3.1	7.1	8.1	8.1	3.5	3.5	2.1	1.4	3.2
42001	25.9N	089.7W	1.5	1.7	2.2	0.4		1.1	0.7	1.1	3.0	7.5	7.1	4.2	2.5	2.1	2.0	1.4	5.2	13.2	11.1	4.4	4.5	3.2	1.5	0.3
42002	26.0N	093.5W	0.4	1.7	1.0	1.1	0.4	1.1	0.5	0.8	2.1	4.1	3.2	2.7	1.7	1.4	1.2	0.7	4.2	11.7	6.8	2.5	2.5	1.3	0.4	1.2
42003	26.0N	085.9W	0.6	1.6	0.8	0.7	1.1	0.8	0.7	0.5	2.2	3.7	2.7	2.1	1.5	0.8	0.5	0.5	4.1	10.6	8.0	2.7	2.1	1.1	0.5	0.7
42007	30.1N	088.8W	1.0	1.5	0.6	1.1	1.9	1.7	0.6	0.6	2.5	9.2	8.2	3.1	2.7	2.7	2.1	1.4	9.0	16.6	12.0	5.7	5.2	3.9	2.1	0.9
42008	28.7N	090.1W	0.3		1.0	0.7	0.4	0.4	0.2	0.2	2.5	9.7	12.2	11.2	6.8	3.1	2.7	1.7	9.0	18.1	13.1	9.0	5.1	3.5	2.0	1.1
42011	29.6N	093.5W	0.4	1.0	0.6	0.4	0.2	1.4	0.9		3.0	5.4	7.8	9.8	11.2	9.1	5.2	2.8	6.5	11.0	11.4	10.1	7.1	4.2	2.1	1.0
42012	29.8N	087.1W	0.4	1.2	0.6	0.4	0.4	0.5	1.1	0.4	4.3	2.7	2.1	2.8	2.3	2.1	1.6	1.1	9.1	8.5	3.6	2.2	3.3	5.7	2.3	0.7
42013	40.4N	066.5W	0.4	0.7	1.0	0.7	0.4	0.4	0.2	0.2	2.2	3.1	2.7	2.1	1.5	0.7	0.7	0.4	4.2	11.2	6.2	2.4	2.4	1.3	0.7	0.4
44004	38.5N	070.7W	0.6	1.0	0.8	0.7	0.4	0.5	0.4	0.3	2.7	3.1	2.2	2.1	1.4	0.9	0.6	0.4	5.1	9.2	6.1	2.8	2.1	1.1	0.5	0.4
44005	42.7N	068.3W	0.4	0.7	0.4	0.4	0.2	0.2	0.2	0.2	2.1	2.8	2.1	1.4	1.2	0.8	0.5	0.4	4.2	8.5	5.5	2.1	1.8	1.1	0.5	0.4
44007	43.5N	070.1W	0.4	0.7	0.4	0.4	0.2	0.2	0.2	0.2	2.1	2.8	2.1	1.4	1.2	0.8	0.5	0.4	4.2	8.5	5.5	2.1	1.8	1.1	0.5	0.4
44008	40.5N	069.4W	0.6	0.8	0.6	0.6	0.3	0.4	0.2	0.2	2.4	3.1	2.5	2.1	1.4	0.9	0.6	0.4	4.8	9.2	6.1	2.5	2.1	1.1	0.5	0.4
44011	41.0N	066.6W	0.4	0.7	0.5	0.5	0.4	0.4	0.2	0.2	2.2	3.1	2.5	2.1	1.4	0.9	0.6	0.4	4.8	9.2	6.1	2.5	2.1	1.1	0.5	0.4
44012	45.3N	066.1W	0.6	0.9	0.5	0.4	0.2	0.2	0.2	0.2	2.5	3.1	2.5	2.1	1.4	0.9	0.6	0.4	4.8	9.2	6.1	2.5	2.1	1.1	0.5	0.4
44013	42.3N	070.8W	0.4	0.6	0.4	0.4	0.2	0.2	0.2	0.2	2.2	3.1	2.5	2.1	1.4	0.9	0.6	0.4	4.8	9.2	6.1	2.5	2.1	1.1	0.5	0.4
44014	37.2N	074.6W	0.4	0.7	0.4	0.4	0.2	0.2	0.2	0.2	2.2	3.1	2.5	2.1	1.4	0.9	0.6	0.4	4.8	9.2	6.1	2.5	2.1	1.1	0.5	0.4
44015	41.1N	082.5W	0.7	1.1	1.0	0.7	1.0	0.7	0.4	0.3	3.6	5.6	5.6	4.6	3.7	4.3	3.6	2.5	6.7	5.6	8.0	3.0	2.3	0.5	1.5	0.8
44016	47.3N	090.0W	1.0	1.6	0.6	0.7	1.4	1.5	1.0	0.6	2.5	7.1	10.2	9.1	5.2	3.1	2.5	1.4	7.3	16.7	12.5	5.1	3.5	2.1	1.2	0.6
44017	42.7N	087.1W		1.5	0.2	0.7	1.1	1.0	0.6	0.4	2.5	9.1	9.1	5.6	3.6	3.0	2.1	1.4	9.0	18.2	12.3	5.1	3.5	2.1	1.2	0.6
44018	41.9N	082.4W	0.6	1.5	0.7	0.6	0.4	0.5	0.4	0.3	3.1	4.5	4.1	3.5	2.9	3.1	2.5	1.7	8.1	12.5	10.2	4.1	3.1	1.7	1.0	0.5
44019	41.6N	082.7W	0.6	1.5	0.7	0.6	0.4	0.5	0.4	0.3	3.1	4.5	4.1	3.5	2.9	3.1	2.5	1.7	8.1	12.5	10.2	4.1	3.1	1.7	1.0	0.5
44021	40.3N	069.3W	0.4	0.7	0.5	0.5	0.4	0.4	0.2	0.2	2.2	3.1	2.5	2.1	1.4	0.9	0.6	0.4	4.8	9.2	6.1	2.5	2.1	1.1	0.5	0.4
44022	42.5N	130.3W	0.8	0.9	0.6	0.6	1.2	1.1	0.6	0.5	3.0	7.9	9.1	5.6	3.6	3.0	2.1	1.4	9.1	18.2	12.3	5.1	3.5	2.1	1.2	0.6
44023	34.3N	120.7W	0.7	1.1	0.8	0.7	0.4	0.5	0.4	0.3	3.1	4.5	4.1	3.5	2.9	3.1	2.5	1.7	8.1	12.5	10.2	4.1	3.1	1.7	1.0	0.5
44024	32.8N	119.5W	0.8	1.4	0.9	0.8	0.5	0.6	0.4	0.3	3.6	5.6	5.6	4.6	3.7	4.3	3.6	2.5	6.7	5.6	8.0	3.0	2.3	0.5	1.5	0.8
44025	33.6N	119.0W	0.7	1.1	1.0	0.7	1.0	0.7	0.4	0.3	3.6	5.6	5.6	4.6	3.7	4.3	3.6	2.5	6.7	5.6	8.0	3.0	2.3	0.5	1.5	0.8
44026	37.8N	122.3W	1.0	1.4	0.8	0.7	1.4	1.5	1.0	0.6	2.5	7.1	10.2	9.1	5.2	3.1	2.5	1.4	7.3	16.7	12.5	5.1	3.5	2.1	1.2	0.6
44027	42.7N	087.1W		1.5	0.2	0.7	1.1	1.0	0.6	0.4	2.5	9.1	9.1	5.6	3.6	3.0	2.1	1.4	9.0	18.2	12.3	5.1	3.5	2.1	1.2	0.6
44028	46.2N	124.2W	1.5	1.7	1.9	1.4	0.9	1.1	1.2	1.1	3.2	11.1	9.1	5.6	3.7	3.1	2.5	1.7	8.1	12.5	10.2	4.1	3.1	1.7	1.0	0.5
44029	39.9N	128.9W	2.2	2.1	1.9	1.7	2.3	2.1	1.6	1.3	4.1	11.1	9.1	5.6	3.7	3.1	2.5	1.7	8.1	12.5	10.2	4.1	3.1	1.7	1.0	0.5
44030	43.4N	124.7W	1.5	1.7	1.9	1.4	0.9	1.1	1.2	1.1	3.2	11.1	9.1	5.6	3.7	3.1	2.5	1.7	8.1	12.5	10.2	4.1	3.1	1.7	1.0	0.5
44111	34.9N	120.9W	2.2	1.9	1.7	2.3	0.8	1.6	1.6	1.6	2.6	1.2	1.8	3.2	5.7	7.4	3.9	10.4	10.1	1.2	0.4	0.7	1.1	4.0	5.1	1.4
44121	37.4N	122.7W	2.3	1.5	0.8	0.7	1.7	1.8	0.6	0.7	3.1	0.6	0.7	0.4	2.8	5.7	3.8	10.4	10.1	1.2	0.4	0.7	1.1	4.0	5.1	1.4
44131	38.2N	123.3W	1.9	1.7	1.9	1.4	2.3	1.6	1.9	1.2	3.1	1.1	1.5	3.1	5.7	7.4	3.9	10.4	10.1	1.2	0.4	0.7	1.1	4.0	5.1	1.4
44161	39.2N	124.7W	3.6	2.4	1.3	1.4	0.5	1.3	2.1	1.5	5.2	1.6	2.1	3.6	4.4	0.4	1.6	13.5	1.6	1.6	0.5		7.5	1.6		2.4
44162	43.3N	127.1W	1.7	1.4	0.6	0.6	0.7	1.1	0.5	0.7	2.2	1.1	1.5	3.1	4.4	0.4	1.6	13.5	1.6	1.6	0.5		7.5	1.6		2.4
46017	60.3N	172.1W	0.4				0.2	0.3			1.8	1.6	0.6	1.2	2.8	3.1	1.4	1.1	9.5	9.7	9.8	1.6	0.3	0.2	3.0	3.5
46022	40.8N	124.5W	1.2	1.5	2.8	2.1	0.8	1.3	1.1	1.4	7.7	9.8	2.6	2.1	1.1	0.7	2.4	4.1	5.2	11.4	5.2	2.1	1.1	0.6	1.1	0.6
46023	34.3N	120.7W	0.7	0.7	0.7	0.4	0.7	1.1	0.4	0.3	3.1	4.5	4.1	3.5	2.9	3.1	2.5	1.7	8.1	12.5	10.2	4.1	3.1	1.7	1.0	0.5
46024	32.8N	119.5W	0.8	1.4	0.9	0.8	0.5	0.6	0.4	0.3	3.6	5.6	5.6	4.6	3.7	4.3	3.6	2.5	6.7	5.6	8.0	3.0	2.3	0.5	1.5	0.8
46025	33.6N	119.0W	0.7	1.1	1.0	0.7	1.0	0.7	0.4	0.3	3.6	5.6	5.6	4.6	3.7	4.3	3.6	2.5	6.7	5.6	8.0	3.0	2.3	0.5	1.5	0.8
46026	37.8N	122.3W	1.0	1.4	0.8	0.7	1.4	1.5	1.0	0.6	2.5	7.1	10.2	9.1	5.2	3.1	2.5	1.4	7.3	16.7	12.5	5.1	3.5	2.1	1.2	0.6
46027	41.8N	124.4W	2.3				0.3				1.1	1.1	1.5	3.1	5.7	7.4	3.9	10.4	10.1	1.2	0.4	0.7	1.1	4.0	5.1	1.4
C58F1	29.7N	085.9W					0.3																			
DPL46	42.6N	079.5W		1.0		0.3		1.4	1.6	1.7																
01SW3	47.1N	090.7W								2.9									0.7	1.0	0.2					
44LN6	43.5N	070.1W				5.9	3.0	1.4	2.1	2.6																
46AM4	47.9N	089.3W	6.4					0.7	1.2	1.1									0.3	0.4						
5P101	41.7N	082.0W				0.3		0.4	1.1	1.9																
5RN31	43.0N	087.7W																								

OCTOBER 1981			% FREQUENCY OF WIND SPEEDS (22- 33 KTS)								% FREQUENCY OF WIND SPEEDS (34-47 KTS)								% FREQUENCY OF WIND SPEEDS (>47 KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.4W	1.5	3.6	4.7	1.4	2.2	1.7	1.6	2.2																
41002	32.3N	075.3W	0.1				0.5	<.05		0.3									0.1	<.05						
41004	29.3N	079.3W		0.4	0.4		0.1																			
42001	25.9N	089.7W	3.6	0.7																						
42002	26.0N	093.5W	0.8							0.5																
42003	26.0N	085.9W																								
42007	30.1N	088.8W			0.4					0.6																
42008	28.7N	090.1W	0.9																							
42011	29.6N	093.5W	0.6																							
42012	29.8N	087.1W	0.5	0.1	1.0	<.05				0.1																
44004	38.5N	070.7W	0.4	1.0				1.5	0.4	0.8																
44005	42.7N	068.3W	0.6	1.1			0.1	0.5	1.0	1.5																
44007	43.5N	070.1W	0.8					1.0	1.2	0.6																
44008	40.5N	069.4W	0.1	0.7				0.5	0.2	0.3																
44011	41.0N	066.6W	0.1							1.4																
44012	45.3N	066.1W						1.7	1.2	0.5																
44013	42.3N	070.8W					0.7	1.1	0.3	0.5																
44014	37.2N	074.6W								1.2																
44015	41.1N	082.5W						1.7	1.2	0.5																
44016	47.3N	090.0W						0.7	0.3	0.5																
44017	42.7N	087.1W																								
44018	41.9N	082.4W																								
44019	41.6N	082.7W																								
44021	40.3N	069.3W	0.1	1.0	2.1	0.6	3.1	1.4	0.8	0.8																
44022	42.5N	130.3W	0.1	0.4	0.3	0.1	0.9												0.1	0.3						
44023	34.3N	120.7W	0.4	0.7	0.7	0.4	0.7	1.4	0.4	0.3																
44024	32.8N	119.5W	0.6	<.05	0.2	0.4	0.4	0.7	0.2	0.4																
44025	33.6N	119.0W	0.4	1.0	2.1	0.6	3.1	1.4	0.8	0.8																
44026	37.8N	122.3W	0.4	0.7	0.7	0.4	0.7	1.4	0.4	0.3																
44027	41.8N	124.4W	7.8	6.6	5.7	4.5	3.5	2.7	2.4	2.8	1.0	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	<.05	<.05	0.1	<.05	<.05	<.05	0.1
C58F1	29.7N	085.9W	1.4	0.8	1.1	0.8	0.8	0.8	0.8	0.8	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
DPL46	42.6N	079.5W	1.2	1.1	1.7	0.4	1.2	2.7	1.4	0.4	0.5	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
01SW3	47.1N	090.7W	0.6	1.1	1.2						0.1	0.1	0.1	0.1	0.1	0.1	0

NOVEMBER 1983			AIR TEMPERATURE (DEG C)								SEA TEMPERATURE (DEG C)								AIR-SEA TEMPERATURE DIFFERENCE (DEG C)							
BUOY	LAT	LONG	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN
41001	34.9N	072.9W	714	30	25.1111	05	11	24.5117	10	18	24.7317	710	30	25.4201	17	20	22.5127	04	22	23.7117	708	30	01.1125	11	10	00.7112	18	03	01.0201
41002	32.3N	077.5W	719	30	24.6111	14	19	24.1112	22	20	24.4119	719	30	25.0103	17	22	23.2127	10	23	24.1117	720	30	00.7129	14	08	00.3112	22	03	00.3102
41003	29.3N	077.9W	718	30	25.9111	17	18	25.1117	22	22	25.5119	719	30	27.2101	04	23	25.1126	01	24	25.3101	720	30	01.1125	10	04	00.1117	22	22	00.2117
41004	25.9N	079.2W	714	30	26.1109	21	14	25.9125	09	23	26.0119	714	30	27.3109	09	23	26.2139	09	23	26.3119	713	30	01.5122	15	06	00.0129	05	01	01.0119
41008	31.0N	081.3W	719	30	25.6111	04	13	25.0125	10	05	25.3117	719	30	26.0123	04	13	25.2139	10	05	25.5119	720	30	00.6123	04	13	00.0129	10	05	00.1117
41009	28.5N	080.2W	719	30	26.4101	21	14	25.9125	10	23	26.1119	719	30	27.1104	21	23	26.0129	06	24	26.2119	718	30	00.6123	10	07	00.4111	07	01	00.5117
41010	26.0N	078.5W	717	30	26.6101	21	14	26.1125	10	23	26.3119	716	30	27.1104	21	23	26.0129	06	24	26.2119	716	30	00.6123	10	07	00.4111	07	01	00.5117
41012	23.4N	071.4W	719	30	25.1111	17	19	24.5117	23	21	24.7119	719	30	25.3101	17	20	24.5127	04	21	24.7117	720	30	00.6123	10	07	00.4111	07	01	00.5117
41013	33.1N	077.7W	719	30	24.6111	14	19	24.1112	22	20	24.4119	719	30	25.0103	17	22	23.2127	10	23	24.1117	720	30	00.7129	14	08	00.3112	22	03	00.3102
41035	44.6N	064.9W	719	30	12.1102	03	04	11.5117	10	17	11.7119	719	30	12.3101	03	04	11.7139	10	17	11.9119	720	30	00.0122	03	04	00.0129	10	17	00.0119
41036	44.3N	053.9W	719	30	12.1102	03	04	11.5117	10	17	11.7119	719	30	12.3101	03	04	11.7139	10	17	11.9119	720	30	00.0122	03	04	00.0129	10	17	00.0119
41038	42.5N	049.3W	719	30	12.1102	03	04	11.5117	10	17	11.7119	719	30	12.3101	03	04	11.7139	10	17	11.9119	720	30	00.0122	03	04	00.0129	10	17	00.0119
44004	38.5N	070.7W	711	30	22.6111	04	04	22.5125	23	14	22.7119	713	30	25.9119	08	17	23.7139	09	20	24.7117	708	30	01.4125	13	13	01.2112	22	08	01.0119
44005	42.7N	068.3W	716	30	14.8129	19	03	13.2128	05	08	13.5119	715	30	15.3101	17	04	14.2139	09	23	14.5119	713	30	00.4125	19	06	00.0119	16	01	00.1119
44007	43.5N	070.1W	033	03	08.1129	18	07	07.6130	18	09	08.0119	033	03	08.6130	18	08	08.1139	29	06	08.2119	033	24	00.2129	18	07	00.0130	18	06	00.1119
44008	40.5N	069.4W	478	21	16.3111	07	05	15.1113	04	10	15.6119	478	21	19.3104	08	14	17.1120	21	17	17.7119	481	21	00.3116	17	11	00.1113	06	08	00.5119
44009	38.5N	074.7W	719	30	14.6129	19	03	13.2128	05	08	13.5119	719	30	15.3101	17	04	14.2139	09	23	14.5119	720	30	00.4125	19	06	00.0119	16	01	00.1119
44011	41.1N	066.6W	719	30	13.6129	19	03	12.5128	05	08	12.8119	719	30	14.3101	17	04	13.3139	09	23	13.6119	720	30	00.4125	19	06	00.0119	16	01	00.1119
44013	42.3N	070.8W	033	03	08.1129	18	07	07.6130	18	09	08.0119	033	03	08.6130	18	08	08.1139	29	06	08.2119	033	24	00.2129	18	07	00.0130	18	06	00.1119
44017	40.7N	073.7W	719	30	14.6129	19	03	13.2128	05	08	13.5119	719	30	15.3101	17	04	14.2139	09	23	14.5119	720	30	00.4125	19	06	00.0119	16	01	00.1119
44018	41.6N	069.2W	719	30	14.6129	19	03	13.2128	05	08	13.5119	719	30	15.3101	17	04	14.2139	09	23	14.5119	720	30	00.4125	19	06	00.0119	16	01	00.1119
44020	41.5N	070.2W	719	30	14.6129	19	03	13.2128	05	08	13.5119	719	30	15.3101	17	04	14.2139	09	23	14.5119	720	30	00.4125	19	06	00.0119	16	01	00.1119
44025	40.3N	073.2W	719	30	14.6129	19	03	13.2128	05	08	13.5119	719	30	15.3101	17	04	14.2139	09	23	14.5119	720	30	00.4125	19	06	00.0119	16	01	00.1119
44027	44.3N	067.3W	612	29	14.9102	19	01	00.0105	10	01	05.7119																		

NOVEMBER 1983			PRESSURE (MB)								WIND SPEEDS (KNOTS)				MEAN WIND SPEED (KNOTS)								
BUOY	LAT	LONG	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN	OBS	MAXIDY	HR	DIR	N	NE	E	SE	S	SW	W	NW	TOTAL
41001	34.9N	072.9W	717	30	1032.5101	15	11	1001.7111	19	11	1016.7	717	4	21125	13	260	11.9	10.6	15.6	22.0	19.5	16.6	17.2	15.9	16.4
41002	32.3N	077.5W	719	30	1030.0101	15	11	1000.9111	22	11	1015.7	708	4	20125	13	270	8.1	11.2	16.0	11.7	18.1	12.8	13.9	13.1	12.9
41003	29.3N	077.9W	720	30	1025.7101	15	11	1006.7111	19	11	1016.0	706	4	27125	10	220	7.6	12.3	16.3	10.6	13.3	14.6	14.2	11.6	12.0
41004	25.9N	079.2W	717	30	1022.9101	16	11	1005.0170	09	11	1015.9	712	3	32120	11	230	16.7	13.9	13.1	10.4	13.6	11.0	10.7	15.1	14.6
41008	31.0N	081.3W	718	30	1027.4116	16	11	1006.3111	19	21	1015.3	712	3	27125	13	270	9.7	10.6	12.4	14.3	15.2	9.7	13.1	15.0	13.1
41009	28.5N	080.2W	716	30	1022.8101	16	11	1008.0170	09	11	1016.1	706	3	32120	17	270	11.1	12.1	12.2	15.0	17.3	14.0	10.2	11.0	12.7
41010	26.0N	078.5W	716	30	1022.8101	16	11	1002.5170	08	11	1016.1	706	3	32120	17	270	11.1	12.1	12.2	15.0	17.3	14.0	10.2	11.0	12.7
41012	23.4N	071.4W	719	30	1025.0129	16	11	1002.5170	08	11	1016.6	576	3	23119	22	260	10.7	9.4	10.5	12.3	13.0	10.7	11.3	14.2	12.2
41013	33.1N	077.7W	717	30	1026.0116	15	11	1000.1170	22	11	1015.7	708	4	21125	13	260	11.5	10.6	15.6	22.0	19.5	16.6	17.2	15.9	16.4
42111	29.6N	093.5W	709	30	1025.8116	16	11	999.7119	20	11	1015.9	697	3	28127	10	230	15.5	12.0	12.7	14.6	13.6	10.3	15.6	16.4	14.3
42121	29.8N	087.1W	716	30	1025.9101	16	11	1002.3170	08	11	1015.9	709	3	28120	07	180	12.1	12.0	13.4	15.7	17.7	15.3	11.2	13.1	13.9
44003	40.6N	068.5W	529	24	1022.5128	18	11	1000.4176	02	11	1015.7	529	3	25125	21	270	11.4	14.5	14.1	14.5	16.1	12.1	10.1	13.1	14.0
44004	38.5N	070.7W	713	30	1034.6101	15	11	992.4125	16	11	1013.6	709	3	34125	17	230	11.6	12.2	12.7	14.9	16.9	17.9	16.5	11.2	15.6
44005	42.7N	068.3W	716	30	1037.7101	15	11	975.9125	21	11	1011.5	709	3	34126	03	260	9.5	9.9	16.9	15.0	11.2	13.1	10.3	14.2	14.4
44007	43.5N	070.1W	033	03	1008.4130	18	07	994.0129	19	11	1009.4	031	3	34120	17	260	7.1	10.1	11.2	7.1	11.2	8.1	7.1	13.1	13.3
44008	40.5N	069.4W	479	21	1036.9101	16	11	990.7112	09	11	1011.0	471	3	26112	15	260	7.2	13.5	11.6	8.9	9.9	12.4	14.5	12.8	12.1
44009	38.5N	074.7W	719	30	1037.4103	15	11	975.9125	21	11	1011.5	709	3	34126	03	260	9.5	9.9	16.9	15.0	11.2	13.1	10.3	14.2	14.4
44011	41.1N	066.6W	719	30	1037.4103	16	11	1002.9108	07	11	1019.4	394	2	20103	01	030	8.9	12.8	5.6	5.2	7.7	7.5	7.0	6.9	09.6
44012	45.3N	069.3W	718	30	1032.5103	16	11	981.0170	19	11	1012.6	618	3	32126	05	250	11.1	11.1	9.9	10.9	14.0	14.2	10.8	12.8	12.0
44013	45.3N	082.8W	720	30	1029.3101	02	18	988.1170	22	11	1012.6	715	3	26111	12	010	17.7	11.3	16.2	14.1	11.2	16.6	13.7	14.8	14.8
44004	37.2N	066.5W	323	14	1036.3103	16	11	1006.2108	07	11	1020.6	323	1	16109	21	250	11.6	13.2	8.0	6.2	8.6	10.2	9.2	6.2	10.4
44005	41.7N	082.5W	718	30	1029.9101	02	11	994.1120	19	11	1016.0	717	3	28121	22	270	14.1	9.2	9.9	8.3	7.6	12.5	12.5	15.5	11.5
45006	47.3N	090.0W	405	17	1037.3103	15	11	1004.5108	08	11	1019.9	397	2	17102	21	260	9.7	11.2	9.1	6.2	8.2	7.2	6.5	6.9	07.8
45007	42.7N	087.1W	518	22	1030.3104	03	04	986.9120	14	11	1014.5	515	3	27111	10	260	16.5	13.6	6.3	9.6	10.3	10.7	12.3	6.1	12.3
45008	44.3N	082.4W	719	30	1029.4101	03	04	990.5120	22	11	1012.3	712	3	28111	20	260	17.7	14.6	13.4	13.4	10.1	17.3	12.6	11.0	14.2
45009	41.6N	073.7W	719	30	1029.4101	03	04	994.4120	20	11	1014.3	709	3	28111	20	260	13.7	9.8	9.3	13.5	8.1	13.5	11.9	11.3	11.6
46001	56.3N	148.3W	583	26	1017.7127	23	05	975.6110	09	01	996.6	709	3	31105	09	270	11.5	15.0	20.5	19.8	13.6	10.5	12.5	15.3	15.3
46002	42.5N	130.7W	708	30	1030.4127	19	05	975.0110	08	01	1008.9	716	3	29110	16	190	13.1	11.2	14.9	18.3	22.8	19.3	19.5	20.2	19.4
46003	51.9N	152.9W	715	30	1030.3101	29	04	994.4120	20	11	1014.3	715	3	31130	17	270	13.9	12.0	13.4	12.8	13.4	13.9	13.4	14.1	14.01
46004	51.0N	136.0W	717	30	1030.5128	02	11	989.3111	05	11	1000.0	701	3	31106	01	250	20.2	16.5	15.0	19.1	19.0	18.5	15.1	19.4	16.4
46005	46.1N	131.0W	718	30	1031.6128	01	11	987.6110	20	11	1004.1	719	4	44105	14	160	8.4	16.4	14.5	22.7	20.7	21.7	22.6	22.2	21.4
46006	40.7N	137.5W	659	30	1031.3121	04	11	981.7110	13	11	1010.4	718	3	32110	08	200	9.1	11.2	23.7	21.3	23.0	20.4	25.0	25.0	27.51
46010	46.2N	124.2W	545	29	1029.9127	19	11	1000.9113	07	11	1012.3	695	3	42120	03	260	5.9	7.1	13.9	12.5	19.3	17.5	17.3	11.0	16.31
46011	34.9N	120.9W	116	05	1021.9102	18	11	1014.9105	00	11	1017.5	116	2	25105	06	330	10.8	9.0		5.0	4.6	5.9	5.5	16.8	13.21
46012	37.4N	122.7W	717	30	1027.6101	15	11	1010.6170	08	11	1017.0	706	3	32110	02	270	5.8	5.8	4.7	10.9	14.3	15.2	14.1	11.5	15.41
46013	38.2N	123.3W	717	30	1026.3127	18	11	1001.4110	21	11	1017.5	692	3	30110	18	140	7.0	4.5	10.7	12.3	11.9	8.7	11.3	15.5	12.61
46014	39.2N	124.0W	714	30	1027.5126	18	11	996.5110	17	11	1015.9	704	3	30110	19	150	10.1	9.1	6.6	17.9	13.6	11.0	12.3	15.9	14.91
46015	42.8N	124.5W	235	10	1009.4126	04	11	994.4121	18	11	999.4	235	1	32121	04	260	13.4	14.6	22.5	20.4	18.4	15.2	9.9	14.9	15.41
46017	60.3N	172.3W	239	30	1006.1123	18	04	984.8121	15	11	990.7	236	1	42121	00	030	16.3	22.1	21.5	17.6	17.7	7.2	20.7	13.7	16.2
46022	40.8N	124.5W	719	30	1029.9126	18	11	989.4110	17	11	1014.3	713	3	37110	17	170	12.3	7.6	7.5	16.5	22.4	16.1	14.5	12.6	16.7
46023	34.3N	120.7W	695	30	1024.3127	23	11	1005.9130	23	11	1017.3	677	3	31121	05	311	11.7	9.1	14.2	11.3	9.7	11.0	11.2	11.5	15.41
46025	33.6N	119.0W	718	30	1023.7127	18	11	1005.9121	14	11	1016.0	660	3	29125	05	311	6.5	4.2	4.8	7.2	7.3	6.1	9.1	11.3	08.6
46026	37.8N	122.7W	718	30	1027.3127	19	11	1001.2110	23	11	1017.1	701	3	33110	19	140	8.3	4.8	6.2	12.9	14.1	10.7	9.4	11.9	11.1
46027	41.8N	124.4W	680	30	1031.1127	09	11	984.3110	17	11	1012.4	682	3	33117	08	260	13.1	5.6	5.1	5.6	10.8	20.4	15.2	14.4	11.5
46028	29.7N	085.9W	710	30	1027.7101	16	11	1006.3170	10	11	1017.6	710	3	20125	02	290	4.0	3.9	6.2	5.6	10.2	6.4	9.7	6.0	06.9
46029	46.1N	124.5W	676	28	1029.0104	19	11	993.4120	07	11	1011.7	676	3	34110	06	270	14.3	14.8	17.4	12.6	11.6	13.6	22.7	18.2	16.91
46035	57.0N	177.6W	713	30	1029.4103	21	04	993.4120	19	11	1014.2	715	3	36111	19	270	14.1	15.1	18.2	19.6	18.2	15.2	16.1	15.4	16.91
46036	48.3N	124.7W	713	30	1031.3103	16	11	983.8120	17	11	1012.7	709	3	40110	22	260	10.1	17.5	17.8	17.9	12.7	12.6	14.9	6.5	14.9

NOVEMBER 1983			WAVE HEIGHTS (METERS)							FREQUENCY OF WAVE HEIGHTS (%)							
BUOY	LAT	LONG	OBS	MAX	DY	HR	MEAN	CIM	1-1.5M	2-2.5M	3-3.5M	4-4.5M	5-7.5M	8-9.5M	>9.5M
41001	34.9N	072.9W	712	8.0	25	17	2.0	7.8	41.1	26.1	14.1	6.5	0.8	0.1	
41002	32.3N	077.5W	716	6.0	25	14	2.0	10.3	42.5	21.7	12.6	6.4	0.2		
41006	29.3N	077.9W	710	4.0	25	17	1.7	4.3	47.6	33.2	12.9	0.5			
42001	25.9N	089.7W	709	3.0	18	73	1.3	21.5	45.9	31.1	1.2				
42002	26.0N	093.6W	708	5.0	27	02	1.5	16.2	50.4	23.7	9.7	0.7			
42003	26.0N	085.9W	138	3.0	02	12	1.3	33.3	26.8	39.1	0.7				
42007	30.1N	088.9W	484	2.0	20	02	0.8	53.5	44.8	1.6					
42039	28.8N	087.0W	625	9.0	20	17	1.2	27.5	48.6	20.4	3.2	0.1			
44003	40.8N	068.5W	708	7.5	25	23	2.3	9.3	27.7	27.1	24.1	11.0	2.1		
44004	38.5N	070.7W	694	8.5	26	06	2.3	8.9	29.3	29.2	19.1	12.9	1.5	0.7	
44005	42.7N	068.3W	702	8.0	26	02	2.4	8.9	25.7	29.2	21.0	11.9	2.5	0.4	
44007	43.5N	070.1W	032	3.5	29	16	1.0		65.6	34.4					
44008	40.5N	069.4W	455	4.5	12	17	1.9	18.9	24.3	31.4	15.8	9.9			
44009	38.5N	074.7W	377	3.0	09	23	1.3	20.9	44.8	27.0	7.1				
44011	41.1N	066.6W	685	4.5	24	07	1.6	15.1	34.0	31.1	10.5	1.8			
44013	42.3N	070.8W	681	3.5	11	13	1.6	20.4	31.0	39.3	8.8				
44014	39.2N	074.4W	592	3.0	28	05	1.1	32.4	53.5	13.4	0.1				
44017	40.7N	072.0W	697	4.5	02	23	1.9	40.4	59.5						
44018	41.6N	069.2W	492	5.5	11	18	1.8	33.9	32.9	19.1	9.3	7.7			
44020	41.5N	070.2W	706	5.0	11	17	1.7	29.0	38.0	27.0	16.1	3.8			
44025	40.3N	073.2W	695	3.5	11	18	1.1	37.7	52.4	9.9	0.0	0.0			
44027	44.3N	067.3W	494	8.5	09	06	3.6		14.4	21.9	21.1	29.8	10.6	2.8	
46001	56.3N	148.3W	620	12.0	10	20	4.7		3.7	7.0	19.0	47.4	19.9	3.0	
46002	42.5N	130.7W	709	11.0	30	20	4.2		8.2	23.7	29.6	24.9	9.6	3.8	0.3
46004	51.0N	136.0W	717	8.5	04	00	4.2			0.5	29.8	49.9	11.2	1.7	
46005	46.1N	131.0W	718	10.0	17	19	4.6		3.4	6.8	20.4	50.4	12.9	4.7	0.1
46006	40.7N	137.5W	717	10.0	10	15	4.4		5.2	14.2	29.4	33.5	13.9	3.5	0.2
46010	46.2N	124.2W	676	8.5	28	01	3.7	0.4	10.8	16.4	21.4	38.0	11.8	0.7	
46011	34.9N	120.9W	116	4.5	05	17	2.4		38.1	22.4	39.6	7.7			
46012	37.4N	122.7W	717	7.0	15	04	2.9	0.4	12.6	30.5	33.5	19.5	1.3		
46013	38.2N	123.3W	713	7.0	13	22	3.2	0.2	5.1	38.9	36.4	22.5	0.8		
46014	39.2N	124.0W	712	8.0	13	19	3.4		4.4	28.5	33.0	27.5	6.1	0.2	
46022	40.8N	124.5W	708	8.5	14	07	3.7		3.2	29.1	29.5	32.9	7.8	0.9	0.4
46023	34.3N	120.7W	033	1.5	01	23	1.4		8.8						
46025	33.6N	119.0W	699	3.5	21	19	1.9	21.3	47.7	27.1	3.7				
46026	37.8N	122.7W	704	5.5	16	22	2.4	1.7	23.8	45.7	19.1	0.5			

NOVEMBER 1983			TOTAL FREQUENCY OF WIND SPEEDS (%)							TOTAL FREQUENCY OF WIND DIRECTIONS (%)							
BUOY#	LAT	LONG	CALM	<4KT	4-10KT	11-21KT	22-33KT	34-47KT	>47KT	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W		2.8	18.4	53.3	24.3	1.3		5.8	4.1	10.3	3.2	13.0	13.8	26.3	23.4
41002	32.3N	075.3W		9.6	30.6	42.5	7.2			6.1	7.7	8.3	5.0	17.2	12.9	23.0	21.8
41004	29.3N	077.3W		5.4	35.6	45.5	3.5			7.6	10.7	11.9	11.6	14.3	9.3	17.2	16.4
42001	25.9N	089.7W		3.1	22.7	59.9	14.4			14.3	13.0	17.7	23.6	12.0	3.6	3.2	12.6
42002	26.0N	093.6W		3.5	29.8	59.4	7.3			16.4	8.9	12.0	27.7	23.6	4.5	1.9	7.1
42003	26.0N	085.9W		3.6	32.9	50.6	3.7			11.6	13.2	10.7	17.0	7.8	10.4	11.4	18.4
42007	30.1N	088.9W		3.1	32.3	53.2	11.4			8.0	10.9	7.6	22.9	15.8	6.8	7.2	20.9
42008	28.7N	095.3W		2.4	28.3	60.5	8.5	0.3		14.3	9.5	16.7	12.1	20.1	9.8	1.2	14.7
42011	29.6N	095.5W	0.3	2.4	23.7	63.1	10.3	0.7		17.2	7.3	16.5	28.1	15.6	3.6	1.1	9.6
42121	29.8N	087.1W		4.2	22.6	65.3	7.9			12.1	11.8	13.7	17.1	11.3	5.5	6.0	20.6
42122	30.0N	088.3W		4.1	28.6	60.8	17.0	1.5		9.4	5.5	10.1	13.5	10.0	8.7	13.4	19.6
44004	38.5N	070.7W		3.9	20.6	52.8	23.0	0.3		5.3	12.5	9.6	9.6	10.3	9.6	17.8	14.5
44005	42.7N	068.3W		3.7	25.5	58.6	10.1	0.1		5.3	6.8	12.0	11.2	12.9	11.5	23.3	17.0
44007	43.5N	070.1W		6.1	33.5	56.9				2.7	6.1		10.1		18.2	40.2	12.8
44008	40.5N	069.4W		4.5	39.9	49.0	6.6			4.0	4.7	16.3	19.6	6.7	10.4	26.9	16.4
44011	48.0N	087.6W		12.7	46.2	41.1				14.0	38.1	1.3	1.1	18.1	11.7	8.5	7.0
45002	45.3N	086.3W		2.1	29.1	60.0	8.7			29.7	7.1	6.2	11.9	11.9	6.3	6.3	8.5
45003	45.3N	082.8W		2.9	23.4	52.5	11.2			15.6	9.8	13.7	9.7	12.1	17.0	10.6	11.5
45004	47.2N	086.5W		3.7	47.1	49.2				25.2	20.1	2.0	1.2	19.2	15.9	6.2	10.1
45005	41.7N	082.4W		4.0	43.7	44.0	8.3			7.8	5.5	9.6	12.2	14.2	22.9	14.5	13.4
45006	47.3N	090.0W		13.6	53.1	33.2				10.8	29.8	6.8	6.4	17.3	13.0	9.6	4.3
45007	42.7N	087.1W		5.0	40.8	44.1	10.1			27.8	8.6	4.6	13.3	23.6	9.6	13.2	9.3
45008	44.3N	082.4W		3.7	31.7	50.8	13.8			16.7	9.5	8.4	16.6	10.5	17.5	10.2	10.6
45009	41.6N	082.0W		4.4	43.7	46.4	5.5			9.7	2.2	7.1	10.5	15.7	24.6	16.8	13.3
46001	56.3N	148.3W		3.1	26.9	48.7	21.7			22.1	5.0	10.4	22.7	8.0	13.2	15.3	3.4
46002	42.5N	130.3W		1.6	10.9	48.3	37.8	1.5		0.6	3.3	3.7	8.3	12.4	25.7	31.8	14.2
46003	51.9N	155.7W		0.7	17.5	59.8	20.2	1.8		0.3	0.3	1.1	7.1	16.4	25.3	23.1	25.6
46004	51.6N	136.0W		2.1	19.8	52.8	25.2			4.2	2.7	7.7	10.4	16.7	15.3	24.6	18.4
46005	46.1N	131.0W		1.4	8.6	39.8	42.6	7.6		1.1	2.3	4.2	11.1	15.6	26.0	25.4	14.3
46006	40.7N	137.7W		0.3	5.8	31.8	44.2	7.8	0.3	3.8		0.2	6.5	12.4	26.6	28.2	22.2
46010	46.2N	124.2W		3.2	17.0	48.7	22.4	6.7		16.8	1.2	16.8	6.1	10.9	22.5	14.1	9.6
46011	34.9N	120.9W		0.9	17.9	58.6	2.6			26.7	0.2		0.9	10.6	5.2	2.2	54.3
46012	37.4N	122.7W		10.5	41.2	37.5	9.9	0.1		7.4	1.7	2.5	12.0	22.3	5.7	7.4	17.0
46013	38.2N	123.3W		9.0	31.2	50.9	9.0			1.9	3.8	13.4	22.6	6.1	7.2	11.5	34.4
46014	39.2N	124.0W		6.0	23.6	56.3	12.6	1.6		9.6	3.1	6.7	17.4	6.8	4.6	5.3	24.5
46015	43.3N	170.3W		5.0	19.5	45.1	23.4	5.1	1.7	20.7	12.8	8.0	5.6	4.9	9.0	9.0	1.1
46017	60.3N	172.3W		3.0	17.4	46.2	28.4	5.1		27.9	12.9	11.8	11.2	4.2	1.0	5.9	15.1
46021	40.6N	124.5W		2.5	31.9	48.9	13.4	3.2		17.0	4.5	5.9	17.0	14.8	9.3	7.5	6.0
46023	34.5N	120.7W		3.4	25.4	52.9	17.7			20.2	0.6	2.9	7.8	6.9	5.5	5.9	52.4
46025	33.6N	119.0W		19.1	48.2	27.7	5.0			8.6	6.0	5.2	9.4	7.1	5.4	19.1	42.3
46026	37.8N	122.7W		10.3	37.7	40.4	9.7			9.9	3.1	10.6	10.6	17.0	5.6	10.2	32.9
46027	41.8N	124.4W	2.9	9.1	40.2	30.5	12.3	2.3		7.8	5.7	8.2	12.8	15.7	6.9	6.5	33.2
46028	35.7N	121.9W	3.0	23.7	46.1	10.3				13.6	25.9	16.7	11.3	6.1	1.8	11.7	12.9
46042	36.8N	122.4W	1.0	8.1	36.8	35.5	17.7	2.0		6.9	3.8	14.6	20.0	13.7	5.5	11.7	24.0
46047	32.4N	119.5W	1.5	9.1	28.7	35.9	21.6	3.2		17.1	22.3	9.7	6.3	10.1	13.4	14.3	6.9
46050	44.6N	124.5W	0.2	2.4	33.7	48.9	14.3	0.5		10.2	20.8	9.3	9.4	10.5	5.4	18.1	16.2
46053	34.2N	119.8W	0.9	9.1	39.9	36.8	13.2	0.1		10.5	20.5	17.0	9.5	9.2	11.7	12.8	7.9
46054	34.3N	120.5W	1.3	6.6	33.4	41.3	17.2	1.5		9.6	5.9	9.2	13.0	13.8	21.2	13.0	14.2
46059	38.0N	129.9W	5.0	10.2	32.8	38.9	12.2	0.9		23.2	7.0	6.0	8.5	14.0	16.8	14.8	9.8

NOVEMBER 1983			% FREQUENCY OF WIND SPEEDS (<4 KTS)							% FREQUENCY OF WIND SPEEDS (4-10 KTS)							
BUOY#	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.5	0.3	0.2	0.5	0.6	1.2	0.5	0.5	2.3	1.1	1.4	0.1	1.0	2.4	4.3	5.6
41002	32.3N	071.3W	0.9	0.3	0.2	0.7	1.5	1.4	1.4	1.1	3.6	2.8	2.4	1.4	4.6	2.4	7.3	8.0
41004	29.3N	077.3W	0.8	0.4	0.2	0.5	0.6	1.1	0.5	0.5	3.2	2.5	2.6	0.6	3.2	2.4	6.7	8.6
42001	25.9N	089.7W	0.1	0.1	0.2	0.2	0.4	0.6	0.5	0.5	0.2	0.4	0.4	0.7	1.0	1.2	0.5	1.0
42002	26.0N	093.6W	0.2	0.2	0.2	0.5	0.5	0.6	0.4	0.7	0.2	0.2	0.4	0.4	1.1	0.4	0.1	0.4
42003	26.0N	085.9W	1.7	0.8	0.8	0.8	0.8				1.2	0.7	0.8	0.8	0.8			
42007	30.1N	088.9W	0.3	0.1		0.1	0.2	0.1	0.1	0.1	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1
42008	28.7N	095.3W		0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.4	0.2	0.2	0.1	0.2	0.1	0.1	0.1
42011	29.6N	095.5W	0.4		0.2	0.2	0.2	0.1	0.1	0.1	0.2	0.1	0.2	0.1	0.2	0.1	0.1	0.1
42121	29.8N	087.1W	0.8	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.2
42122	30.0N	088.3W	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.2
44004	38.5N	070.7W	0.8	0.8		0.8	0.8	0.8	0.8	0.8	0.2	0.2		0.2	0.2	0.2	0.2	0.2
44005	42.7N	068.3W	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
44007	43.5N	070.1W																
44008	40.5N	069.4W																
44011	48.0N	087.6W																
45002	45.3N	086.3W	0.8	0.4	0.5						0.4	0.2	0.2					
45003	45.3N	082.8W	5.0	2.1	0.3	1.7	0.6	0.1	2.7	0.4	0.4							
45004	47.2N	086.5W																
45005	41.7N	082.4W	0.6								0.2	0.2						
45006	47.3N	090.0W																
45007	42.7N	087.1W	7.3	0.7		0.4	0.5	0.1	0.1	0.1	1.4							
45008	44.3N	082.4W	5.1	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.9	0.4						
45009	41.6N	082.0W	0.4								0.1	0.1						
46001	56.3N	148.3W		0.5	0.4	3.3	3.3	1.1	0.8		1.4	0.5						
46002	42.5N	130.3W	0.1	0.4	0.4	1.3	3.5	6.7	7.7	11.8	0.3							
46003	51.9N	155.7W	0.1			0.6	3.9	6.2	7.9	13.6	0.9							
46004	51.6N	136.0W	0.3	0.4	0.4	0.5	2.1	7.9	7.9	11.6	0.7							
46005	46.1N	131.0W			0.3	1.2	5.9	6.5	11.1	11.1	0.6							
46006	40.7N	137.7W	2.2			0.3	3.3	5.7	11.7	16.9	0.2							
46010	46.2N	124.2W				0.4	0.7	3.1	11.6	13.5	0.2							
46011	34.9N	120.9W																
46012	37.4N	122.7W	0.1			0.3	0.3	1.6	0.5	0.2	0.1							
46013	38.2N	123.3W				0.9	3.0	0.5	1.6	0.5	0.2							
46014	39.2N	124.0W				0.5	9.1	0.6	2.3	0.1	0.2							
46015	43.3N	170.3W	1.4	0.5	1.2	2.2	10.4	3.1	0.9		0.7	0.5	0.1					
46017	60.3N	172.3W	1.1	1.0	0.6	1.7	3.1	4.4	0.7		1.5	1.0	0.1					
46021	40.6N	124.5W					3.3	11.7	3.1	1.6	1.2	1.6	0.5					
46023	34.5N	120.7W	0.4			0.1	0.6				0.2	0.1						
46025	33.6N	119.0W																
46026	37.8N	122.7W					1.4	1.9	1.6	0.5	0.2	0.1	0.2					
46027	41.8N	124.4W	0.2				7.1	11.4	11.7	0.5	0.5	0.2						
46028	35.7N	121.9W																
46042	36.8N	122.4W					0.9		0.9		0.4	0.1	0.2					
46047	32.4N	119.5W	0.3				0.9	1.4	3.1	0.5	0.2	0.1	0.1					
46050	44.6N	124.5W	0.2	0.2			1.7	1.3	1.3	0.2	1.3	0.6						
46053	34.2N	119.8W	0.2	0.2			1.7	1.3	1.3	0.2	1.3	0.6						
46054	34.3N	120.5W	0.4	0.2			1.7	1.3	1.3	0.2	1.3	0.6						
46059	38.0N	129.9W	1.7	0.9	0.2	0.3	0.8	0.1	0.1	0.2	0.7	0.1						

NOVEMBER 1983			% FREQUENCY OF WIND SPEEDS (11-21 KTS)							% FREQUENCY OF WIND SPEEDS (22- 33 KTS)							
BUOY#	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	2.3	1.1	1.4	2.4	4.3	5.6	2.7	2.5	0.7	0.4	1.0	0.1	0.4	0.8	1.1	0.9
41002	32.3N	071.3W	3.6	2.8	2.4	1.4	7.1	3.6	4.8	5.0	1.2	1.1	0.8	0.2	0.8	0.6	1.1	1.0
41004	29.3N	077.3W	3.1	2.5	2.4	2.1	6.1	3.5	4.6	4.8	0.8	0.8	0.8	0.2	0.8	0.4	0.8	0.8
42001	25.9N	089.7W	4.1	2.1	3.4	4.4	2.4	0.7	2.5	2.4	0.4	0.3	0.4	0.5	0.2	0.1	0.1	0.3
42002	26.0N	093.6W	4.2	1.8	2.3	5.1	4.5	0.8	3.1	2.4	0.4	0.2	0.3	0.5	0.4	0.1	0.1	0.2
42003	26.0N	085.9W	1.7	0.8	0.8	0.8					0.2	0.1	0.1	0.1				
42007	30.1N	088.9W	2.1	0.8	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
42008	28.7N	095.3W	2.1	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
42011	29.6N	095.5W	2.1	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
42121	29.8N	087.1W	2.1	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
42122	30.0N	088.3W	2.1	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
44004	38.5N	070.7W	2.1	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
44005	42.7N	068.3W	2.1	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
44007	43.5N	070.1W																
44008	40.5N	069.4W																
44011	48.0N	087.6W																
45002	45.3N	086.3W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
45003	45.3N	082.8W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
45004	47.2N	086.5W																
45005	41.7N	082.4W																
45006	47.3N	090.0W																
45007	42.7N	087.1W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
45008	44.3N	082.4W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
45009	41.6N	082.0W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46001	56.3N	148.3W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46002	42.5N	130.3W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46003	51.9N	155.7W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46004	51.6N	136.0W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46005	46.1N	131.0W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46006	40.7N	137.7W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46010	46.2N	124.2W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46011	34.9N	120.9W																
46012	37.4N	122.7W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46013	38.2N	123.3W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46014	39.2N	124.0W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46015	43.3N	170.3W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46017	60.3N	172.3W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46021	40.6N	124.5W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46023	34.5N	120.7W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46025	33.6N	119.0W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46026	37.8N	122.7W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46027	41.8N	124.4W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46028	35.7N	121.9W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46042	36.8N	122.4W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46047	32.4N	119.5W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46050	44.6N	124.5W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46053	34.2N	119.8W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46054	34.3N	120.5W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1
46059	38.0N	129.9W	3.4	1.1	1.1	2.2	3.1	0.8	1.1	1.2	0.3	0.2	0.2	0.3	0.2	0.1	0.1	0.1

NOVEMBER 1983			% FREQUENCY OF WIND SPEEDS (34-47 KTS)							% FREQUENCY OF WIND SPEEDS (>47 KTS)							
BUOY#	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W																
41002	32.3N	071.3W																
41004	29.3N	077.3W																
42001	25.9N	089.7W																
42002	26.0N	093.6W																
42003	26.0N	085.9W																
42007	30.1N	088.9W																
42008	28.7N	095.3W																
42011	29.6N	095.5W																
42121	29.8N	087.1W																
42122	30.0N	088.3W																
44004	38.5N	070.7W																
44005	42.7N	068.3W																
44007	43.5N	070.1W																
44008	40.5N	069.4W																
44011	48.0N	087.6W																
45002	45.3N	086.3W																
45003	45.3N	082.8W																
45004	47.2N	086.5W																
45005	41.7N	082.4W																
45006	47.3N	090.0W																
45007	42.7N	087.1W																
45008	44.3N	082.4W																
45009	41.6N	082.0W																
46001	56.3N	148.3W																
46002	42.5N	130.3W																
46003	51.9N	155.7W																
46004	51.6N	136.0W																
46005	46.1N	131.0W																
46006	40.7N	137.7W																
46010	46.2N	124.2W																
46011	34.9N	120.9W																
46012	37.4N	122.7W																
46013	38.2N	123.3W																
46014	39.2N	124.0W																
46015	43.3N	170.3W																
46017	60.3N	172.3W																
46021	40.6N	124.5W																
46023	34.5N	120.7W																
46025	33.6N	119.0W																
46026	37.8N	122.7W																
46027	41.8N	124.4W																
46028	35.7N	121.9W																
46042	36.8N	122.4W																
46047	32.4N	119.5W																
46050	44.6N	124.5W																
46053	34.2N	119.8W																
46054	34.3N	120.5W																
46059	38.0N	129.9W																

DECEMBER 1987

AIR TEMPERATURE (DEG C)

BUOY	LAT	LONG	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN
41001	34.9N	072.4W	626	28	23.1	07	03	07.0	25	01	17.1
41002	32.3N	075.4W	632	28	24.9	15	16	04.2	25	04	20.2
41006	29.3N	077.3W	633	28	26.2	17	06	14.2	25	04	22.4
41007	25.9N	080.1W	631	28	27.1	21	15	11.4	30	20	22.9
41008	26.0N	080.5W	634	28	25.8	03	18	09.5	25	01	21.2
41009	28.5N	080.2W	596	27	27.4	04	14	11.9	30	19	23.5
41010	28.9N	078.5W	581	27	21.4	06	02	04.3	30	04	19.1
41012	30.1N	081.1W	566	27	22.8	03	15	07.0	23	17	19.4
41013	33.4N	077.7W	589	26	23.6	03	19	04.7	29	19	16.6
41025	35.0N	075.4W	582	26	19.4	07	01	04.0	30	04	15.2
41036	34.5N	077.1W	623	27	19.4	07	05	06.4	29	11	15.4
42001	25.9N	089.7W	478	24	12.0	27	08	00.3	31	05	15.1
42002	25.9N	093.6W	335	23	10.5	07	06	07.0	08	01	15.0
42003	26.0N	085.9W	100	06	13.7	23	02	01.2	22	01	14.4
42007	30.1N	088.8W	037	13	02.6	05	06	00.0	10	07	01.4
42019	27.9N	095.3W	116	08	05.4	12	13	04.2	09	07	02.0
42020	26.0N	096.7W	210	12	06.0	12	03	00.2	10	04	01.0
42036	28.5N	084.5W	109	07	03.5	25	07	00.0	01	04	01.8
42039	28.8N	086.0W	155	09	06.2	12	18	01.0	07	03	03.5
42040	29.2N	088.2W	155	09	06.2	12	18	01.0	07	03	03.5
44004	38.5N	070.7W	623	27	19.4	07	05	06.4	29	11	15.4
44005	43.2N	069.1W	478	24	12.0	27	08	00.3	31	05	15.1
44007	43.5N	070.1W	335	23	10.5	07	06	07.0	08	01	15.0
44008	40.5N	069.4W	100	06	13.7	23	02	01.2	22	01	14.4
44009	38.5N	074.7W	037	13	02.6	05	06	00.0	10	07	01.4
44011	41.1N	066.6W	116	08	05.4	12	13	04.2	09	07	02.0
44013	42.3N	070.8W	210	12	06.0	12	03	00.2	10	04	01.0
44014	36.6N	074.8W	109	07	03.5	25	07	00.0	01	04	01.8
44017	40.6N	072.7W	155	09	06.2	12	18	01.0	07	03	03.5
44018	41.2N	069.3W	155	09	06.2	12	18	01.0	07	03	03.5
44020	41.4N	070.6W	636	28	06.2	17	19	01.1	14	06	04.7
44021	42.5N	130.3W	631	28	14.2	17	15	04.2	23	15	10.9
44023	45.5N	129.7W	498	20	06.8	21	04	03.3	13	05	05.1
44024	51.0N	136.0W	627	28	09.1	12	19	01.4	22	14	06.5
44025	40.1N	073.2W	633	28	11.2	17	18	01.0	24	03	08.3
44026	48.2N	124.3W	525	23	11.5	18	03	00.2	20	19	07.6
46001	56.3N	148.1W	636	28	06.2	17	19	01.1	14	06	04.7
46002	42.5N	130.3W	631	28	14.2	17	15	04.2	23	15	10.9
46003	51.9N	155.7W	498	20	06.8	21	04	03.3	13	05	05.1
46004	51.0N	136.0W	627	28	09.1	12	19	01.4	22	14	06.5
46005	46.1N	131.0W	633	26	11.2	17	18	01.0	24	03	08.3
46006	40.7N	137.3W	631	28	14.2	13	19	04.2	25	11	11.6
46011	34.9N	120.9W	636	28	06.2	17	19	01.1	14	06	04.7
46012	37.4N	122.7W	620	26	15.1	25	01	07.1	22	12	12.5
46013	38.2N	123.3W	636	28	06.2	17	19	01.1	14	06	04.7
46014	39.2N	124.0W	635	28	14.5	25	00	04.1	23	17	09.5
46015	43.3N	124.8W	039	06	01.9	31	05	00.1	31	09	01.0
46017	60.3N	172.7W	145	12	04.9	21	00	01.1	02	01	01.9
46022	40.8N	124.5W	636	28	15.7	19	06	01.3	23	15	06.4
46023	34.3N	120.7W	617	28	16.4	12	00	17.1	21	14	13.9
46025	33.8N	119.0W	636	28	19.5	14	23	17.2	21	21	15.3
46026	37.8N	122.7W	060	03	14.2	17	01	11.0	01	17	11.8
46027	41.8N	124.4W	622	27	14.3	09	03	01.1	22	13	09.7
46028	35.8N	121.7W	611	28	16.0	18	23	11.2	21	15	13.6
51001	23.4N	162.3W	623	27	26.6	17	03	11.5	04	21	23.1
C58F11	29.7N	085.4W	571	26	22.8	13	20	08.7	29	21	19.2
DRL961	42.6N	079.9W	013	01	03.7	13	2	03.7	13	2	03.7
015W31	47.1N	087.7W	008	01	07.7	14	08	07.7	14	08	07.7
GLLN61	43.5N	076.1W	280	18	06.7	17	02	01.0	05	11	02.4
004W61	47.9N	089.3W	005	02	00.2	12	05	00.0	12	04	00.1
SF131	41.7N	082.6W	295	14	06.5	12	13	01.0	03	01	02.3
S6W31	43.8N	087.7W	116	09	02.7	11	00	01.0	03	21	00.9

SEA TEMPERATURE (DEG C)

BUOY	LAT	LONG	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN
41001	34.9N	072.4W	626	28	24.3	19	12	20.4	31	06	21.9
41002	32.3N	075.4W	632	28	25.9	18	01	21.8	13	04	23.1
41006	29.3N	077.3W	633	28	26.3	05	21	22.9	31	05	25.0
41007	25.9N	080.1W	631	28	28.0	23	23	23.6	31	23	25.5
41008	26.0N	080.5W	634	28	25.6	01	20	23.5	30	21	24.8
41009	28.5N	080.2W	596	27	27.4	04	14	23.7	30	04	25.6
41010	28.9N	078.5W	581	27	28.1	06	13	24.1	31	04	26.4
41012	30.1N	081.1W	566	27	27.4	02	21	22.7	30	20	25.1
41013	33.4N	077.7W	589	26	23.6	03	19	04.7	29	19	16.6
41025	35.0N	075.4W	582	26	19.4	07	01	04.0	30	04	15.2
41036	34.5N	077.1W	623	27	19.4	07	05	06.4	29	11	15.4
42001	25.9N	089.7W	478	24	12.0	27	08	00.3	31	05	15.1
42002	25.9N	093.6W	335	23	10.5	07	06	07.0	08	01	15.0
42003	26.0N	085.9W	100	06	13.7	23	02	01.2	22	01	14.4
42007	30.1N	088.8W	037	13	02.6	05	06	00.0	10	07	01.4
42019	27.9N	095.3W	116	08	05.4	12	13	04.2	09	07	02.0
42020	26.0N	096.7W	210	12	06.0	12	03	00.2	10	04	01.0
42036	28.5N	084.5W	109	07	03.5	25	07	00.0	01	04	01.8
42039	28.8N	086.0W	155	09	06.2	12	18	01.0	07	03	03.5
42040	29.2N	088.2W	155	09	06.2	12	18	01.0	07	03	03.5
44004	38.5N	070.7W	636	28	06.2	17	19	01.1	14	06	04.7
44005	43.2N	069.1W	478	24	12.0	27	08	00.3	31	05	15.1
44007	43.5N	070.1W	335	23	10.5	07	06	07.0	08	01	15.0
44008	40.5N	069.4W	100	06	13.7	23	02	01.2	22	01	14.4
44009	38.5N	074.7W	037	13	02.6	05	06	00.0	10	07	01.4
44011	41.1N	066.6W	116	08	05.4	12	13	04.2	09	07	02.0
44013	42.3N	070.8W	210	12	06.0	12	03	00.2	10	04	01.0
44014	36.6N	074.8W	109	07	03.5	25	07	00.0	01	04	01.8
44017	40.6N	072.7W	155	09	06.2	12	18	01.0	07	03	03.5
44018	41.2N	069.3W	155	09	06.2	12	18	01.0	07	03	03.5
44020	41.4N	070.6W	636	28	06.2	17	19	01.1	14	06	04.7
44021	42.5N	130.3W	631	28	14.2	17	15	04.2	23	15	10.9
44023	45.5N	129.7W	498	20	06.8	21	04	03.3	13	05	05.1
44024	51.0N	136.0W	627	28	09.1	12	19	01.4	22	14	06.5
44025	40.1N	073.2W	633	28	11.2	17	18	01.0	24	03	08.3
44026	48.2N	124.3W	525	23	11.5	18	03	00.2	20	19	07.6
46001	56.3N	148.1W	636	28	06.2	17	19	01.1	14	06	04.7
46002	42.5N	130.3W	631	28	14.2	17	15	04.2	23	15	10.9
46003	51.9N	155.7W	498	20	06.8	21	04	03.3	13	05	05.1
46004	51.0N	136.0W	627	28	09.1	12	19	01.4	22	14	06.5
46005	46.1N	131.0W	633	26	11.2	17	18	01.0	24	03	08.3
46006	40.7N	137.3W	631	28	14.2	13	19	04.2	25	11	11.6
46011	34.9N	120.9W	636	28	06.2	17	19	01.1	14	06	04.7
46012	37.4N	122.7W	620	26	15.1	25	01	07.1	22	12	12.5
46013	38.2N	123.3W	636	28	06.2	17	19	01.1	14	06	04.7
46014	39.2N	124.0W	635	28	14.5	25	00	04.1	23	17	09.5
46015	43.3N	124.8W	039	06	01.9	31	05	00.1	31	09	01.0
46017	60.3N	172.7W	145	12	04.9	21	00	01.1	02	01	01.9
46022	40.8N	124.5W	636	28	15.7	19	06	01.3	23	15	06.4
46023	34.3N	120.7W	617	28	16.4	12	00	17.1	21	14	13.9
46025	33.8N	119.0W	636	28	19.5	14	23	17.2	21	21	15.3
46026	37.8N	122.7W	060	03	14.2	17	01	11.0	01	17	11.8
46027	41.8N	124.4W	622	27	14.3	09	03	01.1	22	13	09.7
46028	35.8N	121.7W	611	28	16.0	18	23	11.2	21	15	13.6
51001	23.4N	162.3W	623	27	26.6	17	03	11.5	04	21	23.1
C58F11	29.7N	085.4W	571	26	22.8	13	20	08.7	29	21	19.2
DRL961	42.6N	079.9W	013	01	03.7	13	2	03.7	13	2	03.7
015W31	47.1N	087.7W	008	01	07.7	14	08	07.7	14	08	07.7
GLLN61	43.5N	076.1W	280	18	06.7	17	02	01.0	05	11	02.4
004W61	47.9N	089.3W	005	02	00.2	12	05	00.0	12	04	00.1
SF131	41.7N	082.6W	295	14	06.5	12	13	01.0	03	01	02.3
S6W31	43.8N	087.7W	116	09	02.7	11	00	01.0	03	21	00.9

AIR-SEA TEMPERATURE DIFFERENCE (DEG C)

BUOY	LAT	LONG	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN
41001	34.9N	072.4W	626	28	01.6	07	03	-18.0	25	01	-04.9
41002	32.3N	075.4W	632	28	01.6	07	04	-17.1	25	04	-03.0
41006	29.3N	077.3W	633	28	00.8	15	21	-10.1	25	04	-02.6
41007	25.9N	080.1W	631	28	01.9	18	17	-15.5	25	00	-02.6
41008	26.0N	080.5W	634	28	00.5	05	21	-14.0	24	04	-03.6
41009	28.5N	080.2W	596	27	01.7	29	12	-12.0	25	04	-03.2
41010	28.9N	078.5W	581	27	00.3	03	15	-17.0	23	17	-07.3
41012	30.1N	081.1W	566	27	02.4	27	08	-15.7	23	17	-05.7
41013	33.4N	077.7W	589	26	-03.1	29	11	-09.6	29	11	-06.4
41025	35.0N	075.4W	582	26	-04.7	29	19	-16.6	29	11	-09.5
41036	34.5N	077.1W	623	27	-04.2	29	19	-16.6	29	11	-09.5
42001	25.9N	089.7W	478	24	12.0	27	08	00.3	31	05	15.1
42002	25.9N	093.6W	335	23	10.5	07	06	07.0	08	01	15.0
42003	26.0N	085.9W	100	06	13.7	23	02	01.2	22	01	14.4
42007	30.1N	088.8W	037	13	02.6	05	06	00.0	10	07	01.4
42019	27.9N	095.3W	116	08	05.4	12	13	04.2	09	07	02.0
42020	26.0N	096.7W	210	12	06.0	12	03	00.2	10	04	01.0
42036	28.5N	084.5W	109	07	03.5	25	07	00.0	01	04	01.8
42039	28.8N	086.0W	155	09	06.2	12	18	01.0	07	03	03.5
42040	29.2N	088.2W	155	09	06.2	12	18	01.0	07	03	03.5
44004	38.5N	070.7W	636	28	06.2	17	19	01.1	14	06	04.7
44005	43.2N	069.1W	478	24	12.0	27	08	00.3	31	05	15.1
44007	43.5N	070.1W	335	23	10.5	07	06	07.0	08	01	15.0
44008	40.5N	069.4W	100	06	13.7	23	02	01.2	22	01	14.4
44009	38.5N	074.7W	037	13	02.6	05	06	00.0	10	07	01.4
44011	41.1N	066.6W	116	08	05.4	12	13	04.2	09	07	02.0
44013	42.3N	070.8W	210	12	06.0	12	03	00.2	10	04	01.0
44014	36.6N	074.8W	109	07	03.5	25	07	00.0	01	04	01.8
44017	40.6N	072.7W	155	09	06.2	12	18	01.0	07	03	03.5
44018	41.2N	069.3W	155	09	06.2	12	18	01.0	07	03	03.5
44020	41.4N	070.6W	636	28	06.2	17	19	01.1	14	06	04.7
44021	42.5N	130.3W	631	28	14.2	17	15	04.2	23	15	10.9
44023	45.5N	129.7W	498	20	06.8	21	04	03.3	13	05	05.1
44024	51.0N	136.0W	627	28	09.1	12	19	01.4	22	14	06.5
44025	40.1N	073.2W	633	28	11.2	17	18	01.0	24	03	08.3
44026	48.2N	124.3W	525	23	11.5	18	03	00.2	20	19	07.6
46001	56.3N	148.1W	636	28	06.2	17	19	01.1	14	06	04.7
46002	42.5N	130.3W	631	28	14.2	17	15	04.2	23	15	10.9
46003	51.9N	155.7W	498	20	06.8	21	04	03.3	13	05	05.1
46004	51.0N	136.0W	627	28	09.1	12	19	01.4	22	14	06.5
46005	46.1N	131.0W	633	26	11.2	17	18	01.0	24	03	08.3
46006	40.7N	137.3W	631	28	14.2	13	19	04.2	25	11	11.6
46011	34.9N	120.9W	636	28	06.2	17	19	01.1	14	06	04.7
46012	37.4N	122.7W	620	26	15.1	25	01	07.1	22	12	12.5
46013	38.2N	123.3W	636	28	06.2	17	19	01.1	14	06	04.7
46014	39.2N	124.0W	635	28	14.5	25	00	04.1	23	17	09.5
46015	43.3N	124.8W	039	06	01.9	31	05	00.1	31	09	01.0
46017	60.3N	172.7W	145	12	04.9	21	00	01.1	02	01	01.9
46022	40.8N	124.5W	636	28	15.7	19	06	01.3	23	15	06.4
46023	34.3N	120.7W	617	28	16.4	12	00	17.1	21	14	13.9
46025	33.8N	119.0W	636	28	19.5	14	23	17.2	21	21	15.3
46026	37.8N	122.7W	060	03	14.2	17	01	11.0	01	17	11.8
46027	41.8N	124.4W	622	27	14.3	09	03	01.1	22	13	09.7
46028	35.8N	121.7W	611	28	16.0	18	23	11.2	21	15	13.6
51001	23.4N	162.3W	623	27	26.6	17	03	11.5	04	21	23.1
C58F11	29.7N	085.4W	571	26	22.8	13	20	08.7	29	21	19.2
DRL961	42.6N	079.9W	013	01	03.7	13	2	03.7	13	2	03.7
015W31	47.1N	087.7W	008	01	07.7	14	08	07.7	14	08	07.7
GLLN61	43.5N	076.1W	280	18	06.7	17	02	01.0	05	11	02.4
004W61	47.9N	089.3W	005	02	00.2	12	05	00.0	12	04	00.1
SF131	41.7N	082.6W	295	14	06.5	12	13	01.0	03	01	02.3
S6W31	43.8N	087.7W	116	09	02.7	11	00	01.0	03	21	00.9

DECEMBER 1987

PRESSURE (MB)

BUOY	LAT	LONG	OBS	DAYS	MAX	DY	HR	MIN	DY	HR	MEAN
41001	34.9N	072.4W	673	28	1036.1	21	15	1000.3	24	19	1018.8
41002	32.3N	075.4W	633	26	1030.7	21	15	1005.5	13	04	1019.6
41006	29.3N	077.3W	633	28	1026.9	09	15	1006.3	12	20	1018.6
41007	25.9N	080.1W	631	28	1024.4	31	16	1009.4	06	19	1018.6
41008	26.0N	080.5W	634	28	1039.7	30	16	1005.7	12	21	1019.8
41009	28.5N	080.2W	595	27	1030.4	26	17	1005.1	13	01	1018.1
41010	28.9N	078.5W	627	28	1029.3	21	16	1004.5	13	04	1018.3
41012	30.1N	081.1W	636	28	1026.4	19	16	1004.9	13	20	1018.3
41013	33.4N	077.7W	633	28	1026.9	09	15	1006.3	12	20	1018.6
41025	35.0N	075.4W	582	26	1029.3	21	16	1004.5	13	04	1018.3
41036	34.5N	077.1W	623	27	1029.3	21	16	1004.5	13	04	1018.3
42001	25.9N	089.7W	478	24	1027.1	29	09	1009.2	06	18	1020.2
42002	25.9N	093.6W	335	23	1036.2	31	13	1002.5	11	04	1020.8
42003	26.0N	085.9W	100	06	1022.6	03	14	994.6	06	21	1012.3
42007	30.1N	088.8W	037	13	1033.4	11	01	992.4	06	19	1017.2
42019	27.9N	095.3W	116	08	1047.7	23	21	987.5	11	01	1014.0
42020	26.0N	096.7W	210	12	1026.4	19	19	986.0	19	13	1014.8
42036	28.5N	084.5W	109	07	1029.1	19	02	979.1	06	21	1009.4
42039	28.8N	086.0W	155	09	1039.4	23	22	988.0	12	16	1014.4
42040	29.2N	088.2W	155	09	1031.4	23	10	988.4	07	19	1014.4
44004	38.5N	070.7W	636	28	1031.4	23	10	1006.7	06	20	1016.4
44005	43.2N	069.1W	328	14	1037.4	11	05	998.5	06	22	1015.7
44007	43.5N	070.1W	303	13	1035.4	11	00	995.4	06	18	1018.0
44008	40.5N	069.4W	180	08	1022.6	03	14	994.6	06	21	1012.3
44009	38.5N	074.7W	244	13	1035.4	11	01	992.4	06	19	1017.2
44011	41.1N	066.6W	636	28	1047.7	23	21	987.5	11	01	1014.0
44013	42.3N	070.8W	636	28	1026.4	19	19	986.0	19	13	1014.8
44014	36.6N	074.8W	469	27	1042.7	24	02	979.1	06	21	1009.4
44017	40.6N	072.7W	631	28	1039.4	23	22	988.0	12	16	1014.4
44018	41.2N	069.3W	636	28	1031.4	23	10	988.4	07	19	1014.4
44020	41.4N	070.6W	636	28	1026.4	04	20	992.4	08	21	1014.6
44021	42.5N	130.3W	629	28	1032.1	23	07	989.1	10	03	1016.4
44023	45.5N	129.7W	620	28	1035.4	11	06	995.6	03	17	1019.3
44024	51.0N	136.0W	631	28	1033.4	11	02	993.1	03	17	1019.7
44025	40.1N	073.2W	636	28	1030.7	21	15	1004.5	13	04	1018.3
44026	48.2N	124.3W	629	28	1032.1	23	07	989.1	10	03	1016.4
46001	56.3N	148.1W	636	28	1047.7	23	21	987.5	11	01	1014.0
46002	42.5N	130.3W	636	28	1026.4	19	19	986.0	19	13	1014.8
46003	51.9N	155.7W	498	20	1029.1	19	02	979.1	06	21	1009.4
46004	51.0N	136.0W	633	28	1039.4	23	22	988.0	12	16	1014.4
46005	46.1N	131.0W	632	26	1031.4	23	10	988.4	07	19	1014.4
46006	40.7N	137.3W	634	28	1026.4	04	20	992.4	08	21	1014.6
46011	34.9N	120.9W	636	28	1029.3	21	16	1004.5	13	04	1018.3
46012	37.4N	122.7W	599	26	1029.3	21	16	1004.5	13	04	1018.3
46013	38.2N	123.3W	637	28	1029.3	21	16	1004.5	13	04	1018.3
46014	39.2N	124.0W	635	28	1029.3	21	16	1004.5	13	04	1018.3
46022	40.8N	124.5W	633	28	1029.3	21	16	1004.5	13	04	1018.3
46025	33.8N	119.0W	617	28	1029.3	21	16	1004.5	13	04	1018.3
46026	37.8N	122.7W	059	03	1029.3	21	16	1004.5	13	04	1018.3
46028	35.8N	121.7W	613	28	1029.3	21	16	1004.5	13	04	1018.3
51001	23.4N	162.3W	622	28	1029.3	21	16	1004.5	13	04	1018.3

WIND SPEEDS (KNOTS)

BUOY	LAT	LONG	OBS	MAX	DIR	MEAN VECTOR	DIR	MEAN SCALAR	DIR
41001	34.9N	072.4W	673	43	125	11	300	16.5	16.9
41002	32.3N	075.4W	633	26	110	11	101	15.1	11.0
41006	29.3N	077.3W	633	28	112	11	115	15.0	11.2
41007	25.9N	080.1W	631	28	115	11	360	14.5	11.2
41008	26.0N	080.5W	634	28	360	16	360	16.8	11.4
41009	28.5N	080.2W	595	27	110	11	150	16.3	13.1
41010	28.9N	078.5W	627	28	113	11	113	15.5	11.2
41012	30.1N	081.1W	636	28	115	11	150	16.3	13.1
41013	33.4N	077.7W	633	28	110	11	115	15.0	11.2
41025	35.0N	075.4W	582	26	113	11	113	15.5	11.2
41036	34.5N	077.1W	623	27	113	11	113	15.5	11.2
42001	25.9N	089.7W	478	24	120	11	120	17.0	13.8
42002	25.9N	093.6W	335	23	120	11	120	17.0	13.8
42003	26.0N	085.9W	100	06	120	11	120	17.0	13.8
42007	30.1N	088.8W	037	13	120	11	120	17.0	13.8
42019	27.9N	095.3W	116	08	120	11	120	17.0	13.8
42020	26.0N	096.7W	210	12	120	11	120	17.0	13.8
42036	28.5N	084.5W	109	07

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TOTAL FREQUENCY OF WIND SPEEDS (%)

RUSH	LAT	LONG	CALM	1-3KNT	4-10KNT	11-21KT	22-33KT	34-47KT	>47KT
410011	34.9N	072.9W		3.0	16.4	77.6	79.7	3.3	
410021	32.3N	075.3W		5.9	25.8	50.6	17.7		
410061	29.3N	077.3W		2.7	26.0	67.7	13.6		
470011	25.9N	084.7W		0.8	15.5	66.7	17.1		
470021	26.0N	093.5W		1.1	25.1	66.4	7.4		
470031	26.0N	085.9W		1.2	20.8	70.8	7.1		
470051	30.1N	088.9W		2.3	13.1	61.1	23.5		
470061	28.7N	095.3W		1.3	25.2	55.5	18.0		
470111	29.6N	093.5W	0.9	1.6	15.4	59.6	22.3	1.0	
470121	29.8N	087.1W		1.6	20.6	63.2	14.6		
480031	40.8N	068.5W		1.6	20.5	58.6	18.3	0.8	
480041	38.5N	070.7W		2.6	18.3	68.4	15.5	0.2	
480051	42.7N	068.3W		2.6	20.6	66.0	10.1		
480071	43.5N	070.1W		2.8	24.3	66.2	6.7		
480081	40.5N	069.9W		0.7	23.1	63.8	12.5		
490031	45.3N	082.6W		1.2	21.5	70.9	6.5		
490051	41.7N	082.5W		3.0	29.2	59.5	8.3		
490081	44.2N	082.4W		2.0	32.0	57.2	8.2		
490091	41.6N	082.7W		2.0	40.5	45.8	9.7		
480011	46.3N	148.3W		11.0	34.5	42.6	1.9		
480021	42.5N	130.3W		4.0	28.1	52.4	15.0		
480031	51.9N	155.7W		4.0	38.2	54.9	12.9		
480041	51.0N	138.0W		5.3	30.1	54.3	10.2		
480051	48.1N	131.0W		1.6	21.8	68.4	19.0	3.7	0.4
460061	40.7N	137.7W		0.2	12.1	49.9	32.4	5.4	
460101	46.2N	129.2W		3.7	27.7	58.7	8.9		
460121	37.4N	122.7W		0.2	12.2	76.9	11.0	0.7	
460131	38.2N	123.3W		0.9	15.2	67.6	9.4	1.0	
460141	39.2N	129.7W		0.9	13.9	71.1	13.9	1.0	
460161	43.3N	130.3W		0.8	23.5	70.5	4.5	0.8	
460171	40.3N	132.3W		1.0	30.3	62.9	5.8		
460221	40.8N	129.4W		1.7	12.2	73.4	11.9	1.0	
460231	34.3N	120.7W		5.1	15.6	70.7	26.6		
460261	33.6N	119.0W		19.5	59.6	20.3	0.8		
460241	37.8N	122.5W		3.3	13.3	61.7	1.7		
460271	41.8N	129.4W	4.9	9.1	44.6	33.5	12.7	0.2	
460261	35.8N	121.7W		9.5	24.7	56.8	9.0		
510011	33.4N	167.3W		10.3	71.2	15.4	3.2		
CSBF11	29.7N	085.4W	3.6	27.0	42.3	10.5			
CPL461	42.6N	079.5W	0.8	5.1	25.3	50.0	13.5	5.9	
DISA31	47.1N	090.7W	1.0	4.1	25.3	51.1	14.2	0.3	
GLL961	43.5N	076.3W	0.3	3.9	21.3	45.6	25.4	4.1	
SPAM41	47.9N	089.3W	0.5	0.8	12.1	59.1	23.5	4.5	
SB1011	41.7N	082.6W	0.5	0.3	24.4	52.3	19.3	1.7	
SBW431	43.8N	087.7W	1.0	5.0	30.2	52.2	12.5		

TOTAL FREQUENCY OF WIND DIRECTIONS (%)

RUSH	N	NE	E	SE	S	SW	W	NW
410011	17.0	16.1	6.4	7.4	14.8	11.0	12.5	14.2
410021	12.1	12.5	10.1	9.5	7.4	10.0	10.4	16.0
410061	11.7	14.8	16.5	8.4	12.3	10.0	9.4	8.8
470011	25.8	18.4	15.4	10.1	17.2	4.8	3.4	7.1
470021	25.8	17.5	12.4	22.1	13.2	1.6	1.6	5.4
470031	15.9	20.2	21.5	13.1	13.3	7.5	2.8	5.8
470051	10.1	19.6	19.1	12.2	11.1	9.7	10.3	12.9
470061	17.2	8.8	10.2	13.4	10.4	3.8	4.8	11.4
470111	29.6	18.8	10.3	15.8	7.1	3.4	5.1	5.8
470121	19.8	18.9	13.3	13.1	12.1	5.1	11.0	12.6
480031	18.9	6.6	3.8	11.0	8.8	14.2	20.3	19.6
480041	18.6	9.1	6.6	8.0	5.3	11.8	28.0	10.7
480051	9.3	5.8	5.0	11.1	8.8	18.0	28.4	13.7
480071	15.6	7.5	2.0	3.7	3.6	16.3	38.0	13.5
480081	30.9	5.9	5.6	6.7	1.6	9.9	20.3	13.4
490031	9.3	9.1	13.3	7.3	4.3	13.5	24.3	18.9
490051	5.5	7.8	19.6	3.1	10.9	23.8	20.3	10.1
490081	14.3	5.9	10.0	3.7	4.9	29.3	24.7	20.9
490091	4.7	3.1	16.1	7.3	16.4	24.2	21.0	7.2
480011	5.3	6.4	71.5	29.5	12.9	15.3	10.7	3.5
480021	9.9	12.9	9.6	7.8	10.1	23.0	18.4	17.4
480031	3.9	10.7	18.2	20.3	10.7	12.9	16.3	6.9
480041	6.3	23.9	19.9	11.4	7.9	7.7	17.5	5.9
480051	14.9	7.0	4.9	20.0	11.7	16.5	12.5	13.4
460061	2.6	3.1	17.6	7.9	16.3	22.1	18.3	10.6
460101	5.2	6.4	48.6	6.5	8.1	18.5	6.0	2.6
460121	12.2	2.6	1.9	19.7	19.5	7.7	7.5	32.0
460131	2.7	2.9	14.7	14.9	11.4	7.5	13.7	32.3
460141	14.7	8.5	5.7	28.0	9.5	2.6	7.5	24.5
460161		19.3	27.7	17.4	28.4	4.2	2.3	0.8
460171	7.7	17.8	19.1	31.5	17.4	4.0		0.5
460221	10.3	3.7	5.4	20.4	29.8	12.5	8.8	9.0
460231	17.5	1.2	0.1	7.3	4.5	1.7	4.0	57.7
460261	7.8	3.7	7.6	8.5	4.0	4.7	23.2	40.4
460241		9.6	11.3	21.1	10.0	2.5	12.9	31.7
460271	17.6	7.7	11.7	16.0	25.4	9.4	5.3	4.9
460261	3.4	0.3	1.3	17.7	4.7	3.6	8.6	60.2
510011	19.5	10.8	7.5	15.1	9.4	19.0	8.0	11.5
CSBF11	17.5	20.9	16.0	6.6	6.4	3.2	8.0	9.3
CPL461	12.6	2.6	6.6	7.9	15.4	30.4	19.2	2.6
DISA31	14.6	5.1	8.8	3.7	10.9	15.6	26.7	14.6
GLL961	2.3	18.8	6.8	8.0	8.6	14.9	27.4	13.3
SPAM41	15.4	10.5	6.8	3.0	3.6	9.4	11.5	18.9
SB1011	6.8	6.6	15.1	6.9	7.9	23.1	17.5	7.1
SBW431	10.9	3.5	6.5	8.5	0.9	11.9	33.5	24.9

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% FREQUENCY OF WIND SPEEDS (<4 KTS)

RUSH	LAT	LONG	N	NE	E	SE	S	SW	W	NW
410011	34.9N	072.9W	1.2	1.0			0.2	0.2	0.3	0.4
410021	32.3N	075.3W	0.6	0.9	1.5	1.2	0.8	0.2	0.6	0.6
410061	29.3N	077.3W	0.7	0.4	0.5	0.2	0.3	0.1		0.2
470011	25.9N	084.7W	0.1		0.1	0.0	0.1	0.0	0.2	0.2
470021	26.0N	093.5W								
470031	26.0N	085.9W			0.2	0.2				
470051	30.1N	088.9W								
470061	28.7N	095.3W	112.5	0.2	0.2	0.7		0.1	0.0	0.1
470111	29.6N	093.5W	113.6	3.5	0.7	1.2	0.9	0.5	1.0	1.0
470121	29.8N	087.1W	5.1	1.3		0.7	0.9	0.2	0.1	0.2
480031	40.8N	068.5W	1.7	0.2	1.0	4.0	1.0	1.6	7.8	1.0
480041	38.5N	070.7W	0.5	0.6	0.7	1.1	1.5	1.5	8.5	1.2
480051	42.7N	068.3W		0.6	0.8	1.1	0.4	1.7	5.2	
480071	43.5N	070.1W	0.1			0.7	0.2	0.9	4.8	0.5
480081	40.5N	069.9W			1.0	3.1	0.7		3.6	0.8
490031	45.3N	082.6W			1.9	0.2			0.2	
490051	41.7N	082.5W							2.3	1.7
490081	44.2N	082.4W	0.6						1.8	3.8
490091	41.6N	082.7W							2.0	1.7
480011	56.3N	148.3W			1.8				0.2	
480021	42.5N	130.3W	0.5	0.1	0.9	0.7	1.3	0.1	2.1	1.2
480031	51.9N	155.7W			3.9	4.4	1.3	1.9	2.2	0.2
480041	51.0N	138.0W		0.9	4.1	3.9	1.7		0.2	
480051	48.1N	131.0W	0.3		4.1	2.3	4.6	1.1	2.7	
460061	40.7N	137.7W	1.1	1.9	7.9	1.9	5.5	4.6	6.6	3.6
460101	46.2N	129.2W		4.0	5.1		0.8			
460121	37.4N	122.7W				3.3	3.5	0.7	1.2	2.3
460131	38.2N	123.3W			0.8	2.3	0.9	0.5	1.8	3.0
460141	39.2N	129.7W	0.1			10.1	0.7	0.2	0.9	2.3
460161	43.3N	130.3W		7.0	6.1	12.5	20.6	7.3		
460171	40.3N	132.3W		6.0	1.7	11.7	7.2	4.1		
460221	40.8N	129.4W	4.4	0.6		5.7	11.6	0.8	0.5	1.5
460231	34.3N	120.7W	3.8		3.1	0.9	0.2		0.5	2.0
460251	33.6N	119.0W			0.2	0.7			0.5	
460241	37.8N	122.5W				1.7				
460271	41.8N	129.4W	2.6			3.7	5.6	1.1	0.2	1.6
460261	35.8N	121.7W	0.3			3.1	0.3	0.3	1.5	3.6
510011	33.4N	167.3W				1.2	0.4	1.0		0.8
CSBF11	29.7N	085.4W								
CPL461	42.6N	079.5W				0.9	0.2	0.3	1.9	0.6
DISA31	47.1N	090.7W	4.9	1.3	1.7		1.1	1.3	6.2	0.7
GLL961	43.5N	076.3W				3.9	2.5	5.5	11.9	2.2
SPAM41	47.9N	089.3W	3.8	4.7	1.6	1.7	1.3	4.6	9.2	3.5
SB1011	41.7N	082.6W				0.7	0.7		4.0	5.8
SBW431	43.8N	087.7W	2.8	0.1	1.3	3.3	0.1	0.4	3.9	0.7

% FREQUENCY OF WIND SPEEDS (4-10 KTS)

RUSH	N	NE	E	SE	S	SW	W	NW
410011	5.7	5.9	0.2					
410021	2.7	1.9	1.3	0.2				
410061	3.2	2.3	1.0					
470011	7.2	5.1	1.4	0.2				
470021	2.5	2.0	0.7					
470031	2.5	5.0	4.1	0.8	5.2	1.2	1.2	1.1
470051	2.7	4.9	4.0	2.1	5.4	2.5	1.4	0.7
470061	2.5	5.0	4.0	3.0	2.7	1.5	1.2	0.4
470111	4.9	4.1	3.9	3.1	3.7	1.7	2.2	1.2
470121	2.7	4.1	4.7	4.9	3.1	1.4	0.7	
480031	3.9	10.7	18.2	20.3	10.7	12.9	16.3	6.9
480041	6.3	23.9	19.9	11.4	7.9	7.7	17.5	5.9
480051	8.9	7.0	4.9	20.0	11.7	16.5	12.5	13.4
460061	2.6	3.1	17.6	7.9	16.3	22.1	18.3	10.6
460101	5.2	6.4	48.6	6.5	8.1	18.5	6.0	2.6
460121	12.2	2.6	1.9	19.7	19.5	7.7	7.5	32.0
460131	2.7	2.9	14.7	14.9	11.4	7.5	13.7	32.3
460141	14.7	8.5	5.7	28.0	9.5	2.6	7.5	24.5
460161		19.3	27.7	17.4	28.4	4.2	2.3	0.8
460171	7.7	17.8	19.1	31.5	17.4	4.0		0.5
460221	10.3	3.7	5.4	20.4	29.8	12.5	8.8	9.0
460231	17.5	1.2	0.1	7.3	4.5	1.7	4.0	57.7
460261	7.8	3.7	7.6	8.5	4.0	4.7	23.2	40.4
460241		9.6	11.3	21.1	10.0	2.5	12.9	31.7
460271	17.6	7.7	11.7	16.0	25.4	9.4	5.3	4.9
460261	3.4	0.3	1.3	17.7	4.7	3.6	8.6	60.2
510011	19.5	10.8	7.5	15.1	9.4	19.0	8.0	11.5
CSBF11	17.5	20.9	16.0	6.6	6.4	3.2	8.0	9.3
CPL461	12.6	2.6	6.6	7.9	15.4	30.4	19.2	2.6
DISA31	14.6	5.1	8.8	3.7	10.9	15.6	26.7	14.6
GLL961	2.3	18.8	6.8	8.0	8.6	14.9	27.4	13.3
SPAM41	15.4	10.5	6.8	3.0	3.6	9.4	11.5	18.9
SB1011	6.8	6.6	15.1	6.9	7.9	23.1	17.5	7.1
SBW431	10.9	3.5	6.5	8.5	0.9	11.9	33.5	24.9

% FREQUENCY OF WIND SPEEDS (11-21 KTS)

RUSH	N	NE	E	SE	S	SW	W	NW
410011	11.3	11.1	0.4	0.2				
410021	7.4	6.3	3.1	0.7				
410061	8.5	11.1	11.5	5.1	9.1	7.8	7.0	6.4
470011	18.6	13.3	11.0	7.9	12.1	3.2	2.2	5.3
470021	23.3	15.5	12.4	22.1	13.2	1.6	1.6	5.4
470031	13.4	15.3	17.4	12.3	13.3	7.5	2.8	5.8
470051	7.4	14.7	15.1	9.1	6.4	7.8	8.1	10.5
470061	14.7	7.8	8.2	10.4	7.7	2.3	3.6	11.0
470111	24.7	14.7	8.1	12.7	5.4	1.7	3.0	4.6
470121	16.7	14.8	8.6	8.2	9.0	3.7	9.4	11.4
480031	14.9	6.6	3.8	11.0	8.8	14.2	20.3	19.6
480041	18.6	9.1	6.6	8.0	5.3	11.8	28.0	10.7
480051	9.3	5.8	5.0	11.1	8.8	18.0	28.4	13.7
480071	15.6	7.5	2.0	3.7	3.6	16.3	38.0	13.5
480081	30.9	5.9	5.6	6.7	1.6	9.9	20.3	13.4
490031	9.3	9.1	13.3	7.3	4.3	13.5	24.3	18.9
490051	5.5	7.8	19.6	3.1	10.9	23.8	20.3	10.1
490081	14.3	5.9	10.0	3.7	4.9	29.3	24.7	20.9
490091	4.7	3.1	16.1	7.3	16.4	24.2	21.0	7.2
480011	5.3	6.4	71.5	29.5	12.9	15.3	10.7	3.5
480021	9.9	12.9	9.6	7.8	10.1	23.0	18.4	17.4
480031	3.9	10.7	18.2	20.3	10.7	12.9	16.3	6.9
480041	6.3	23.9	19.9	11.4	7.9	7.7	17.5	5.9
480051	14.9	7.0	4.9	20.0	11.7	16.5	12.5	13.4
460061	2.6	3.1	17.6	7.9	16.3	22.1	18.3	10.6
460101	5.2	6.4	48.6	6.5	8.1	18.5	6.0	2.6
460121	12.2	2.6	1.9	19.7	19.5	7.7	7.5	32.0
460131	2.7	2.9	14.7	14.9	11.4	7.5	13.7	32.3
460141	14.7	8.5	5.7	28.0	9.5	2.6	7.5	24.5
460161		19.3	27.7	17.4	28.4	4.2	2.3	0.8
460171	7.7	17.8	19.1	31.5	17.4	4.0		0.5
460221	10.3	3.7	5.4	20.4	29.8	12.5	8.8	9.0
460231	17.5	1.2	0.1	7.3	4.5	1.7	4.0	57.7
460261	7.8	3.7	7.6	8.5	4.0	4.7	23.2	40.4
460241		9.6	11.3	21.1	10.0	2.5	12.9	31.7
460271	17.6	7.7	11.7	16.0	25.4	9.4	5.3	4.9
460261	3.4	0.3	1.3	17.7	4.7	3.6	8.6	60.2
510011	19.5	10.8	7.5	15.1	9.4	19.0	8.0	11.5
CSBF11	17.5	20.9	16.0	6.6	6.4	3.2	8.0	9.3
CPL461	12.6	2.6	6.6	7.9	15.4	30.4	19.2	2.6
DISA31	14.6	5.1	8.8	3.7	10.9	15.6	26.7	14.6
GLL961	2.3	18.8	6.8	8.0	8.6	14.9	27.4	13.3
SPAM41	15.4	10.5	6.8	3.0	3.6	9.4	11.5	18.9
SB1011	6.8	6.6	15.1	6.9	7.9	23.1	17.5	7.1
SBW431	10.9	3.5	6.5	8.5	0.9	11.9	33.5	24.9

DECEMBER 1987

% FREQUENCY OF WIND SPEEDS (22- 33 KTS)

RUSH	N	NE	E	SE	S	SW	W	NW
410011	0.7	3.6	0.7	3.6	9.6	7.9	5.7	5.9
410021	0.4	3.7	1.0	4.1	2.6	1.3	1.8	2.7
410061	0.3	3.6	0.3	3.2	1.7	1.2	0.3	2.3
470011	0.2	10.6	0.2	2.0	0.4	0.2	0.4	1.3
470021		6.4	0.2			0.1	0.1	
470031		4.2	0.5					
470051								
470061		2.2						
470111	0.2	12.5	0.2	0.7		0.1	0.0	0.1
470121	0.2	13.6	3.5	0.7	1.2	0.9	0.5	1.0
480031		5.1	1.3		0.7	0.9	0.2	0.1
480041	0.2	1.7	0.2	1.0	4.0	1.0	1.6	7.8
480051	0.2	1.7	0.6	0.8	1.1	1.5	1.5	8.5
480071		2.2	0.8	0.1	1.1	0.4	1.7	5.2
480081				0.7	0.2	0.9	4.8	0.5
490031			1.9	0.2			0.2	
490051							2.3	1.7
490081	0.6						1.8	3.8
490091							2.0	1.7
480011			1.8				0.2	
480021	0.5	0.1	0.9	0.7	1.3	0.1	2.1	1.2
480031			3.9	4.4	1.3	1.9	2.2	0.2
480041		0.9	4.1	3.9	1.7		0.2	
480051	0.3		4.1	2.3	4.6	1.1	2.7	
460061	1.1	1.9	7.9	1.9	5.5	4.6	6.6	3.6
460101		4.0	5.1		0.8			
460121				3.3	3.5	0.7	1.2	2.3
460131			0.8	2.3	0.9	0.5	1.8	3.0
460141	0.1			10.1	0.7	0.2	0.9	2.3
460161		7.0	6.1	12.5	20.6	7.3		
460171		6.0	1.7	11.7	7.2	4.1		
460221	4.4	0.6		5.7	11.6	0.8	0.5	1.5
460231	3.8		3.1	0.9	0.2		0.5	2.0
460251			0.2	0.7			0.5	
460241				1.7				
460271	2.6			3.7	5.6	1.1	0.2	1.6
460261	0.3			3.1	0.3	0.3	1.5	3.6
510011				1.2	0.4	1.0		0.8
CSBF11								
CPL461				0.9	0.2	0.3	1.9	0.6
DISA31	0.9	1.3	1.7		1.1	1.3	6.2	0.7
GLL961				3.9	2.5	5.5	11.9	2.2
SPAM41	3.8	4.7	1.6	1.7	1.3	4.6	9.2	3.5
SB1011				0.7	0.7		4.0	5.8
SBW431	2.8	0.1	1.3	3.3	0.1	0.4	3.9	0.7

% FREQUENCY OF WIND SPEEDS (34-47 KTS)

RUSH	N	NE	E	SE	S	SW	W	NW
410011	0.2							
410021								
410061								
470011								
470021								
470031								
470051								
470061								
470111								
470121								
480031								
480041								
480051								
460061	3.9							
460101								
460121								
460131								
460141								
460161								
460171								
460221								
460231								
460251								
460241								
460271								
460261								
510011								
CSBF11								
CPL461								
DISA31								
GLL961								
SPAM41								
SB1011								
SBW431								

% FREQUENCY OF WIND SPEEDS (>47 KTS)

RUSH	N	NE	E	SE	S	SW	W	NW
410011								
410021								
410061								
470011								
470021								
470031								
470051								
470061								
470111								
470121								
480031								
480041								
480051								
460061								
460101								
460121								
460131								
460141								
460161								
460171								
460221								
460231								
460251								
460241								
460271								
460261								
510011								
CSBF11								
CPL461								
DISA31								
GLL961								
SPAM41								
SB1011								
SBW431								

SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS (SSMO'S)

Summary of Synoptic Meteorological Observations

°monthly climatological data for coastal areas
°includes sea surface temperatures, wave heights, winds and more
°based on more than 100 years of ship reports
°means, extremes and distributions
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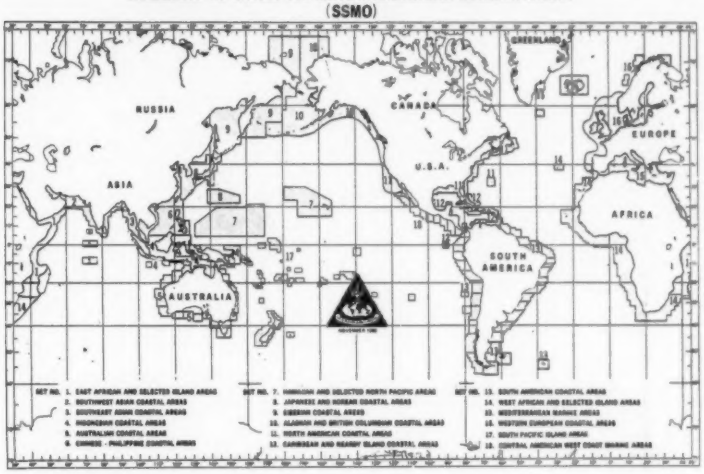
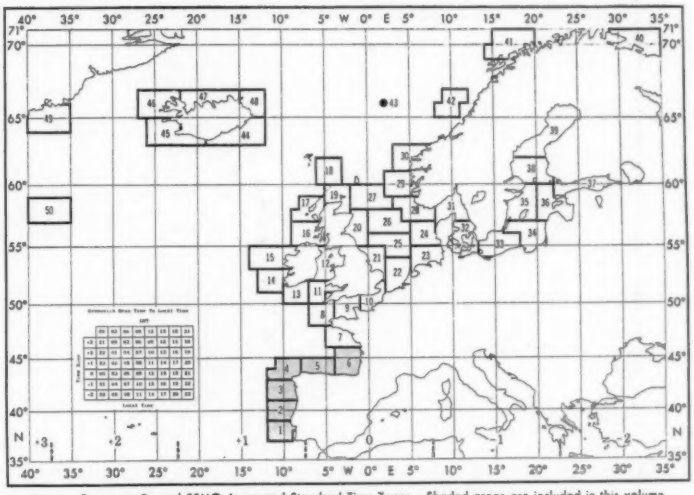
SUMMARY OF SYNOPTIC METEOROLOGICAL OBSERVATIONS
(SSMO)





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National Weather Service, NOAA
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New York, New York 10112
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Mr. Joseph Takach, PMO
National Weather Service, NOAA
Building 51
Newark International Airport
Newark, New Jersey 07114
201-624-0890 (FTS 341-6188)

Mr. Earle Ray brown, Jr., PMO
National Weather Service, NOAA
Norfolf International Airport
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804-441-6326 (FTS 827-6326)

Mr. Peter Connors, PMO
National Weather Service, NOAA
1600 Port Boulevard
Miami, Florida 33132
305-358-6027

Mr. Richard Rasmussen, PMO
National Weather Service, NOAA
Jacksonville International Airport
Box 18367
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National Weather Service, NOAA
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National Weather Service, NOAA
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National Weather Service, NOAA
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APO Miami, Florida 34005
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